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THE AMERICAN
GAS LIGHT JOURNAL
REDMAN & KENNY, N.Y.
PUBLISHING OFFICE No. 32 PINE STREET
DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LIX.—No. 7. Whole No. 949. | NEW YORK, MONDAY, AUGUST 14, 1893. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND CLASS MATTER.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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An Asterisk (*) denotes an illustrated article.

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ELSEWHERE will be found an article, entitled "Electricity in the Home and Office," by Mr. F. A. C. Perrine, in which the author indulges in some roseate speculation. We intended to make editorial comment on it in this issue, but the criticism will not appear until our next.

[OFFICIAL NOTICE.]

Appointment of a Committee of Reception by the American Gas Light Association.

AMERICAN GAS LIGHT ASSOCIATION, OFFICE OF SECRETARY, PROVIDENCE, R. I., June 5th, 1893.

The following named members of this Association are appointed and respectfully requested to serve as a Committee of Reception, whose duty shall be to call upon all foreign gas engineers visiting our country during the continuance of the World's Fair at Chicago, whose names and addresses may be obtained, and to introduce them to other members of our profession, see that they obtain permits to visit the neighboring gas works and other objects of interest, and generally to make their stay in New York as pleasant as possible, and when they leave for Chicago, to give them letters of introduction to the Committee of Arrangements at Chicago: Messrs. Wm. Henry White (chairman), Eugene Vanderpool, William H. Bradley, Fred. S. Benson, William R. Beal, Jos. R. Thomas, Thos. F. Rowland, Jr., Fred. W. Floyd and Oscar Weber.

The Guild of Gas Managers and the Society of Gas Lighting are respectfully requested to co-operate with this committee in extending hospitality to our visiting professional brethren.

A. E. BOARDMAN, President.
A. B. SLATER, JR., Secretary.

[OFFICIAL NOTICE.]

The American Gas Light Association's Greeting to European Gas Engineers.

AMERICAN GAS LIGHT ASSOCIATION, OFFICE OF SECRETARY, PROVIDENCE, R. I., June 5th, 1893.

To the European Gas Engineers—Greeting: The American Gas Light Association will hold its 21st annual convention in the city of Chicago, beginning on the date of Wednesday, October 18th, 1893. It would give the members of the Association great pleasure to meet there as many of the European gas engineers and managers as can make it convenient to be in attendance at the World's Fair at that time. It is suggested that all contemplating visiting the Fair arrange their visits so as to be in Chicago, if possible, at the time of this convention, when they will be most cordially welcomed by the Association and invited to attend the sittings of the body and participate in its discussions of papers presented.

Those engineers who cannot conveniently visit the World's Fair at that time, but must choose some other date, are respectfully requested to send their names and addresses, as soon as they arrive in America, to the AMERICAN GAS LIGHT JOURNAL, No. 32 Pine street, New York City, so that a committee from the Association may be made aware of their presence, and when they may be met, so that they may form the acquaintance of their professional brethren in this country and be made to feel less like a "stranger in a strange land."

A. E. BOARDMAN, President.
A. B. SLATER, JR., Secretary.

OBITUARY—MR. EDWARD JONES.

Edward Jones, gas engineer, formerly Engineer and Superintendent of the South Boston Gas Light Company, died at his home in Boston, August 1, 1893, after a lingering illness. His death was not unexpected, yet the death of so good a man is a shock to his family and friends, who mourn the loss of a kind and loving husband and father and a staunch friend.

He was born in Holywell, North Wales, January 1, 1822. His father was connected with the gas business in Wales, but came to this country

in the early thirties, and both father and son went to work at the gas works in Boston.

Edward Jones commenced his apprenticeship in the gas business July 6, 1834, at the age of 12 years, at what is now known as the North End Station of the Boston Gas Light Company, on Commercial street. This was one year previous to the incorporation of the present Company, and the works were owned by Henry Robinson.

Gas was made from coal and rosin, and the output was less than 25,000 feet per day, and there were only 20 street lamps in the city.

He worked faithfully and industriously, acquiring a practical understanding of every detail of the business, which was the foundation of the knowledge which placed him among the foremost gas engineers of his time. In 1846, while master mechanic of the Company, the Boston Gas Light Company presented him a gold watch as a token of appreciation of his services.

In 1848 he was appointed Constructing Engineer of the firm of Blake & Darracott, builders of gas works, and in this capacity he built and started the following works: Lawrence, Mass., 1848; Providence, R. I., 1848; Fishville, Conn., 1849; Lowell, Mass., 1849; Worcester, Mass., 1849; Richmond, Va., 1851; Cambridge, Mass., 1852; South Boston, Mass., 1852.

These works were built in cities where gas had never been used, and the work included the entire pipe system, storage holders, and the education of the people in the use of an illuminant with the use of which they were wholly unacquainted. His work was well done, and some of it remains to-day as a monument of the skill of one of the earliest gas engineers, and the energy of a man not then 30 years of age. After completing the works at South Boston he decided to remain in charge as Engineer and Superintendent, which positions he retained until failing health incapacitated him for business in 1889. His knowledge, both practical and theoretical, covered a wide range of subjects, and the fact that it was self-acquired made it more thorough and useful. He was a skillful mechanical draughtsman and gas chemist, and his patented inventions include many processes for manufacturing gas, and improvements in nearly every piece of apparatus found in a modern gas works.

When the explosion of gas, in Worcester, December 16th, 1870, destroyed the purifying house and killed the Hon. James B. Blake, the Mayor of Worcester and Engineer of the Gas Company, Edward Jones was placed in charge of the reconstruction, and in an incredibly short time made temporary repairs and lighted the city. His skill as a mechanic and his inventive genius peculiarly fitted him for this class of work, and his services were in demand wherever there was accident or emergency in New England gas works. In 1859 he built a new works in South Boston, in a more desirable location, and in 1884 rebuilt the works and furnished them with modern improvements, making them a model gas works. This was the last piece of construction work by his hands.

He was among the first to join the New England Association of Gas Engineers, and was elected to membership in the American Gas Light Association, October 20, 1875. He was a life member of the Massachusetts Charitable Mechanic Association, having joined October 7, 1857.

He had a deep regard for Freemasonry, and at the time of his death had been a member of St. Paul's Lodge, of South Boston, for 40 years, having been raised, January 26, 1853. He held several offices in the Lodge, and attained the office of Junior Warden, but declined higher offices on account of the engrossing character of his business.

Although born in Wales, his sympathies and education were American, and he was a citizen, full of love for our country and heed for its welfare, yet there lingered in his heart a memory of his birthplace and the land of his fathers. He devoted much time to the study of Welsh history and poetry, and his library is rich with works relating to his native land.

He was married, in 1845, to Anna T. Lane, and after her death he was again married, in 1858, to Hannah Frances Campbell, of Nashua, N. H., who survives him.

He leaves six children: Mrs. John McLean Howard, of Detroit, Mich.; Mrs. J. W. F. Willson, Jr., of Boston; and Mrs. Levi W. Wells, of Canton, Ohio, by the first marriage; and Edward C. Jones, Assistant Engineer of the San Francisco Gas Light Company; Frederick C. Jones, now attending Harvard University, and Mrs. Everett A. Parsons, by the second marriage.

He was a man of moral character and firm principles, unswerving in the performance of duty and faithful to every trust. His reputation as a skillful gas engineer, the memory of his kind and gentle nature and the example of his fruitful life are valued legacies to his children.

[Official Report—Revised by the Secretary—Concluded from Page 185.]

INITIAL MEETING OF THE PACIFIC COAST GAS ASSOCIATION.

Held at the Offices of the San Francisco Gas Light Company, July 11th and 12th.

First Day—Afternoon Session.

THE QUESTION BOX—*Continued.*

Question No 2.—What has been done in firing regenerative furnaces with low grade coals to maintain heats, where coke is worth double the price of coal?

Mr. Parker (of Napa)—As our coke pile was getting too small, and as we had a good demand for coke, the idea occurred to me that I could get fairly good results from low grade coals. One trouble with us is that our furnace is so very narrow the coal cakes up in the furnace and shuts off our draft from the primary. By using a layer of coal with a layer of coke on top, however, we get very good results, and the fire will last twice as long as a coke fire.

Question No. 3.—What are the results from the tar firing of regenerative furnaces?"

Mr. Converse—We have tried that out at the Potrero, and quite successfully. We ran the benches for about three or four months with tar. The heat was too high once or twice, and they started to melt. Still we could run the benches very successfully with tar and keep up an extended and regular heat. We sprayed it in with a steam jet. We had just enough coke fire to cover the bars. We shut our other drafts and are governed entirely by the secondary air. Our furnace is just the reverse of the Flemming bridge wall.

Mr. Crockett—We hardly know what effect it will have on our retorts and settings. I do not think we have arrived at figures yet.

Mr. Parker (of Napa)—I have had some experience with tar fires. We used about three gallons an hour, taking the tar in at the rear of the bench. Our bench differs from most of them. The furnace is deep, and we take the tar in just above the door. We take steam from the top of the boiler just over the bench. Right back of the bench is this opening above the door, and it gives us an even, beautiful heat. We have had no trouble whatever. It did not seem to need any attention. We used about 60 pounds of steam.

Mr. Kenny (of San Diego)—At San Diego we have used a Parson's burner for four years or more, and it has been quite satisfactory in every way. We bring the tar over to the bench, or in front of the bench, which is a Weber. We carry a pressure of steam from 60 to 70 pounds. We use a device for regulating the supply of tar, which we find very good. It consists of a plug, drilled out with a very small hole, and bring a trap down to the burner, and have a stop-cock, if the plug is horizontal—we have different sized plugs. By putting in a plug we can run anywhere from 150 to 160 gallons per hour, as we wish. The plug enters a funnel and drops on the down grade to the burner. It keeps a very even heat, and we like it very much. We found from practice the results we get from a certain amount of tar, and we found the plug to be a much better device than a stop-cock. We used the stop-cock wider open.

Mr. Osborn (of Virginia City)—We had some experience in burning tar. We are now using clay benches. Up to a year ago we used iron retorts. I used all the tar I could and saved about half the coke. I have a little device of my own—a water jacket outside of the pipe going into the furnace, just above the furnace door—that lets the tar in, just dropping it on the coke. Everything else that I have tried will cake up on the end and will not allow the tar to work through. This device worked splendidly. We formerly made gas out of wood, and that is pretty hard material to make run. It is lumpy. It works off too easily, particularly with high heats. I inquired of manufacturers as to using tar on a clay bench, and they told me not to do it.

Mr. Petch (of Eureka)—In Eureka we have no market for tar. To overcome the difficulties under which I labored, I placed a 6 inch tube, and ran a pipe from the boiler down into the tube, so that five minutes before I wanted to pump tar I simply turned the steam loose into that, and we had no trouble. In addition to that it is simply running it to the bench. At first it was not attended to as it should be, and we used about 100 gallons of tar in 24 hours. We used a device something similar to the one spoken of by the gentleman from San Diego. If you get in too much tar, the furnace will fill up. Ours have been in use now something over four years, and they have been let up and down six times.

Mr. Pierson (of Sacramento)—We have had a number of years' ex-

perience. We have no regenerative furnaces, and only a few have been adopted or tried. The effect on the retorts has been to reduce the life of the retort from 10 to 15, or perhaps 20 per cent. Otherwise the burning of the tar is satisfactory. It reduces the life of the clay retort. We use coke on bars, and as it accumulates in there, we draw it the same as we do a coke fire. The retorts burn down quickly.

Mr. Kenny (of San Diego)—I believe that the effect on clay retorts depends largely on having a uniform heat. If you can keep a uniform heat, as required, from our experience with our benches, I cannot see where there would be any injury.

Mr. Eichbaum (of San Francisco)—Ever since I have been in the gas business I have noticed much prejudice against the use of tar in the benches. It has always been said that it cuts off the life of the retort. From my own experience I would say that if that is so, it is owing to causes that are not at all dependent upon the burning of the tar, but from the fact that the retort is sometimes too hot, and they shut it off before it is cool, and put it on again. Everyone who is familiar with the burning of tar in the benches knows very well that the tendency is always to get the benches too hot, and if you have a stack of benches running you will generally find that unless particular pains be taken the men will borrow from the coal benches and patch it on the tar benches, because they can burn a larger amount of tar. My experiences, however, has been that if the bench is properly taken care of and not allowed to get too hot first, and then set off until it gets a little black, that the life of the retort is not at all shortened by the use of tar. A similar prejudice exists against the use of oil under the boiler. Some people say that to burn tar or oil under a boiler will injure it. In my judgment it will do nothing of the kind. I have burned oil and tar largely under the boiler, and I never yet saw any injury to it. I do not believe it will produce any more, if even as much, injury as coal. As to the prejudice against burning tar under benches, I am satisfied it is from a tendency to get up too great a heat and then shut the tar off and let it stay off a little too long. We all know that when taking down a clay bench you will find a number of small cracks along from the inside to the outside of the benches. I believe those are caused by clinkering. It often takes an hour to clinker a clay bench, provided the bench is open and the outside retort is cold, and the inside is very hot. In the same way, and to a greater extent, the changes of temperature, first getting it too hot and then getting it too cold, have the effect of shortening the life of the retort, which effect is not due to the tar itself. That is my judgment from years of experience.

Mr. Wharton (of Fairhaven, Wash.)—I have used tar quite a little, and I have no flues. The greatest objection I have to using tar is the dirt. The smoke will come right down into the retort house almost, and make things so disagreeable that it is almost impossible for the men to work. I began using tar about a year ago, and followed it up for about six months, and I found that the results were very favorable. I have never discovered that my benches or retorts were injured by the use of tar.

Mr. Osborn (of Virginia City)—If the combustion be complete it will be all right. My experience in the use of tar is that you do not get as much clinkering from it as by the use of coke.

Question No. 4.—What is the yield per pound in candle feet from Australian shale and Kentucky shale?

Mr. Jones (of San Francisco)—I have a printed test here of the Australian shale. It is under the name of Alfred Kip, of London, a recognized authority in the gas profession. (Reads figures.)

Mr. Fenner here also submitted a test of figures, giving results with Kentucky cannel.

Mr. Hallett (of Portland)—I have experimented with both the Australian and Kentucky shales. From experiments that I made recently of the Australian shale I found over 80 per cent of volatile matter. I expected to find soot in the retort. The Australian shale is richer than the Kentucky shale, but when you take into account those that have a market for coke I think the Kentucky shale is fully equal to the Australian shale at the same price, putting it in dollars and cents. The coke is very good with the Kentucky shale, while it has not quite so great candle power.

Mr. Pearson (of Sacramento)—The last lot of Australian shale we got was of an inferior quality to that we had previously had. For that reason we made some experiments with Kentucky shale, and we are now using that entirely. We used the same quantity and arrive at about the same results. We have noticed no particular difference in it. As a practical result we find there is no difference in it.

Question No. 5.—Why should gas companies handle gas stoves?

Mr. Eichbaum (of San Francisco)—I should say that the only reason why gas companies should handle gas stoves is that if they do not do it no one else will. When other people see something in it they will take hold of it and relieve the gas companies.

Mr. Crockett (of San Francisco)—I think another reason why gas companies should handle gas stoves is that in handling them they do so without any profit whatever, because they handle them simply for the purpose of selling gas. We sell the stoves at as near cost as it is possible to sell them. Not only do we do that, but we take a greater interest in the stove after it is sold. After a stove is set up the average stove man has no further interest in it. But the gas manufacturer feels that he must see to and look out for a stove after he has sold it, noting that both the stove and the gas are properly used. I therefore think they are the parties to handle gas stoves.

Mr. Roper (of Rockford, Ill.)—The most prominent reason why gas companies should handle gas stoves is that the hardware dealer will place them in the rear of his store, and will not sell the stove unless the purchaser says he will have that and no other. I can cite probably 50 cities where gas stoves have been introduced quite successfully. The dealers have waited on the gas companies saying they were injuring their business, and they have then entered into some kind of an agreement to go out of it and let the dealers handle it. After going out the result was that the dealers would sell them only when the purchaser had been told to buy that and nothing else. There is probably not one burner on the market to day, burning at an inch pressure and consuming 10 feet an hour, that is doing good work. It will not work successfully. We have had the pleasure of taking them out in several of the Eastern cities. The point in the East to day is the question of discounts and not of quality. I made a test. I started in a year ago last May at the Western Gas Association at Detroit. A paper was there read by Mr. Mitchell, of St. Joseph, Mo., on the question of fuel gas as seen through a coal gas man's eyes. He claimed that he would bake 6 pounds of dough with 17½ feet of coal gas, and that it took 64 feet of fuel gas to do the same work, one gas selling at $1.50 per 1,000, and the other at 60 cents. The fuel gas men were there in a body and attacked his paper. As the tests had been made on our stove by both of them, they referred the matter to me, and I told them I thought Mr. Mitchell did exaggerate. I then made a test and invited all the surrounding towns, such as Milwaukee, Chicago, Freeport, Rockford, etc., and they came into Rockford on the 11th day of June, 1892. They tested the matter, set the stove up and timed it—the timing was done by the different ones keeping their own time—and we did the baking. While we intended to have 6 pounds of dough, with 5 pounds 10½ ounces we used 14½ feet of gas. The fuel gas people kept the stove, and I still have it in our test room. I have offered it to them any time to prove whether it took 64 feet of gas to do the desired work, but they have never done it, although we have made them 1,000 stoves, and they give us as much credit as anybody else. The gas man will push it thoroughly, while the hardware man never will.

Mr. Steinman (of Sacramento)—Some six years ago we had $12,000 or so invested in gas stoves, which we rented out. We charged nothing for the use of them in the summer. It went along until two years ago, when we accepted any fair offer for them. We cut down our income from the stoves about one-half. We then established quarters on a side street and imported a car load of stoves, but we hardly sold two stoves a month. Some two months since we took a store on the principal street to exhibit our goods, employed a canvasser, and the result is that in the last five weeks we have sold over 500 stoves. Before that we went to the different gasfitters and plumbers and told them if they would do that we would give them a free advertisement on the back of our bills. They did not try to sell them, however, so we were compelled to go into this business. We did think we would give them a reduction on it, but we could not see our way clear to doing that. Then came up the question of separate meters, and we concluded to let it go just as it is. Every day the demand for gas stoves increases in Sacramento.

Mr. Roper (of Rockford)—Last year the Chicago Gas Light Company handled stoves themselves and had five sales in one morning. They sold over 60,000 gas stoves. They then went out of business, and the man they sold out to is now in the hands of the sheriff.

Mr. Osborn (of Virginia City)—I would like to ask if any of these gentlemen have had any experience with gas stoves in a cold country?

Mr. Roper (of Rockford)—Last winter, in our town of 25,000 inhabitants, we sold 2,700 gas stoves.

Question No. 6.—Iron sponge: by placing in purifying box too deep, is there not more danger by charring trays and part of sponge than by placing lightly, and will it not take much longer to revivify? In what manner can iron sponge be used with most economy?

Mr. Jones (of San Francisco)—I do not think you can get sponge in a purifier too deep. When we get to working through the relief holder I

have no doubt that what litttle trouble we have will entirely disappear. I think Mr. Vanderwhite, Superintendent of the works at North Beach, can give us some information about the charring of the trays, if there has been any.

Mr. Vanderwhite—I have not noticed any charring of trays at the North Beach station, due to reviving the sponge in the boxes.

Question No. 7.—Is naphthaline deposited more in works using jets than in those using fans?

Mr. Jones (of San Francisco)—That question has been asked continuously for the last 10 years in every Gas Association in the United States, I think. When they introduce the steam exhauster they take the gas away more quickly from the retorts, and the tendency is to increase the heat of the retorts. It is easier for them to get gas, and I think they make a little naphthaline which they did not make before, and that naphthaline will come to their notice with ordinary scrubbing, particularly where a man has paid no attention to the scrubbing. One of our best remedies for naphthaline is blowing out with steam. I never found any injury, in an old gas works, from naphthaline, in using the steam jets. Benzole vapor is generated with the naphthaline, and 1 per cent. of it is as good as 2½ per cent. of naphthaline. So a benefit goes with the evil.

Question No. 8.—Are mechanical exhausters run with less steam to obtain the same results than from jets?

Mr. Hallett (of Portland)—During the past year we have had occasion to run the jet occasionally for a few hours. Experience is that it takes considerable more steam to run with the jet than it does with the rotary. In fact, it takes about 75 to 80 pounds of steam to run a steam jet, while we can run the rotary with 40 pounds. Presumably the cost of fuel would be considerably more, running with them, than with a rotary exhauster.

Mr. Osborn (of Virginia City)—Recently I have dumped everything that I got from the ashpan out in the yard, and let it dry. The ash will screen easily and you can pick out the clinkers, and I procure enough fine coke to run my exhauster, simply using that which comes from the clinkers.

IN MEMORIAM.

Mr. Eichbaum (of San Francisco)—called the attention of the Association to the death of Mr. Peter E. De Mill, late of San Jose (who was accidentally drowned in Lake Michigan, near the city of Chicago, while returning from a trip to the World's Fair), in some well-timed and feeling remarks, and closed by offering the following resolutions, which were unanimously adopted:

Whereas, We, the members of the Pacific Coast Gas Association, have learned with profound sorrow of the unfortunate accident which brought about the untimely end of one who was well known and so highly esteemed by so many of the members of this Association,

Resolved, That while we know that nothing we can say can assuage the grief of his surviving relatives, still we offer to them our heartfelt and deepest sympathy in this their great grief at losing one so much beloved and respected by all of those with whom he was brought in contact.

Resolved, That a copy of this preamble and resolutions be sent to Mrs. A. A. Mone, of Detroit, as the expression of this Association.

Mr. E. C. Jones (of San Francisco) seconded the motion with the following remarks: In seconding the motion for the adoption of the resolutions presented by Mr. Eichbaum, it is with a feeling of the deepest sorrow for our loss in the death of Mr. De Mill. I met the gentleman shortly after my arrival in San Francisco, and although I have resided on this Coast but a short time, we became warm friends. Mr. De Mill must be looked upon as one of the originators of an idea of forming a Gas Association on the Pacific Coast, and he would have been a very active member of the same. I received a letter from him shortly before his death, in which he stated that it was his intention to return to San Francisco, and hoped to reach here in time to attend our meeting. From a short but intimate acquaintance with Mr. De Mill, I feel that in his death the gas industry of the Pacific Coast, and in fact the industry in general, has lost a good and efficient worker.

Mr. Quilty, President of the San Jose Gas and Electric Light Company, made the following remarks:

Although the body of our friend, Mr. Peter E. De Mill, lies in an unmarked grave,* in the cold waters of Lake Michigan, he has left a monument that is lasting and indestructible, in the new gas works constructed by him at San Jose, the perfect working of which is a constant reminder of his skill as a gas engineer, and a testimonial to the thoroughness of his work. I wish to say that I esteemed Mr. De Mill most highly as a friend, and we all deplore his loss.

The resolutions were then unanimously adopted.

*Mr. De Mill's body was recovered early in July.—Eds. A. G. L. J.

Second Day, Wednesday, July 12th.

The members of the Association assembled at the office of the San Francisco Gas Light Company at the appointed time, 8:30 A. M., and proceeded to the Mission Street Wharf, No. 1, taking the steamer Rockaway to the Union Iron Works, there inspecting their magnificent plant, as well as the various ships in process of construction, all by invitation of the President of the Company.

After the visit to the Union Iron Works, the Association proceeded to the Potrero Station of the San Francisco Gas Light Company, and a brief hour or so was spent in the inspection of the plant at that place. The steamer Rockaway was then again boarded, and steamed rapidly to the North Beach Station of the San Francisco Gas Light Company, where a very inviting luncheon was served in the new meter room of the Company. After all had partaken quite heartily of the good things spread before them, Mr. John Clements, of Red Bluff, moved that the thanks of the Association be tendered the Union Iron Works of San Francisco, for the use of the steamer Rockaway, and for their kindness in showing the members through their fine plant at the Potrero, that the same be engrossed in the minutes and a copy of the same sent to the Union Iron Works. The motion was duly seconded, and was unanimously adopted.

The afternoon was then spent in an examination of the San Francisco Gas Light Company's new gas works at North Beach, and at the conclusion of the same, on motion of Mr. Hallett, of Portland, Ore., by a unanimous vote, the thanks of the Association were tendered the San Francisco Gas Light Company for the use of their rooms during the meeting of the Association, and for the entertainment of the members during the sessions of the same.

Mr. Quilty (of San Jose) then made some appropriate remarks on the formation of the new Gas Association, and the pleasant hours that the members had passed together during the first annual meeting, and alluded to the bright future before the Association, concluding with a motion that the thanks of the Association be tendered Messrs. J. B. Crockett and E. C. Jones, of San Francisco, for their kindness and attention shown the members during the last two days.

By invitation of Mr. Eichbaum, of the Pacific Gas Improvement Company, the members then visited the works of that Company, also situated at North Beach, and inspected the same, after which they returned to the North Beach Station, again boarding the steamer Rockaway, and returned to the city, each and all highly pleased with the day's entertainment.

Electricity in the Home and Office.

[Written for *Engineering Magazine* by Mr. Frederic A. C. Perrine, D. Sc.]

A writer in one of our scientific journals a few years ago, in commenting upon the proposed utilization of the water power at Niagara Falls, stated that, when the generation of electricity had been cheapened by the use of such great reservoirs of energy, we might hope to see it aiding us in many of the annoying and wearying details of daily life. The housewife would be able to run her sewing machine without fatigue, our homes would be heated by means of the electric current, the business man would sit in his office ventilated by an electric fan and go back and forth between his home and business on a genuine rapid transit electric road.

Had such a paragraph been shown to a busy electrician at the time he would have classed it among the many guesses at what "might be;" a "prophesy" if you choose, but hardly worthy of his serious attention.

"Yes," he would have said, "all this is perfectly possible, but you and I will hardly see it; electricity, however produced, costs too much." And perhaps he would have cited to you the famous "electrical heater" man of the Philadelphia Exhibition in 1884, who, by some hook or crook, obtained a space in the Franklin Institute Exhibition of that year, but who figured in it most largely as the butt of all the practical jokers among that very lively set of exhibitors.

It was easy enough in 1884 to figure out the losses all along the line from the coal pile or the waterfall to the heat developed, and prove that this fellow was a fool; but the existence at the present day of several large companies making and selling such apparatus is sufficient proof that he was not, even then, dreaming of impossibilities.

While the eyes of the majority have been turned towards the great central station lighting plants, networks of electric railroads, or legal

battles over the ownership of fundamental ideas, a constant progress has been made in the problem of the domestic utilization of the varied powers of the electric current and its fellow, the oft-neglected magnet.

To-day it is not merely possible to rival the wonders of the home of Monte Cristo in an everyday office building, or in the fittings of a modern residence where an electric current is available, but a contractor will not be so much surprised at the elaborate demands you make upon him. He will sit down with his catalogues and, allowing you to choose the particular style of fittings required, will give you an estimate, and to-morrow be ready to put his men at work upon your dwelling, putting in place many conveniences you now hardly dream of.

But other such residences have already been completed, and we will see many interesting and ingenious devices for the conveniences of a family should we accept the hospitality of a host who is fortunate enough to have kept himself acquainted with the progress of electrical appliances and to be possessed of a dwelling where the electrical current is readily available. Perhaps he prefers burning his coal under the boiler of an engine located in his barn to consuming it in the numerous fires necessary for cooking, heating and lighting in a country mansion, or it may be that the mains of a central station run near his city house. At any rate he has the necessary current available.

Let us suppose that we have met on a rainy winter evening and have accepted the invitation of this genial host to dine and spend a night under his roof. He knows that we have never before seen a house appointed as his, and perhaps with a touch of pardonable pride he calls into action all the appliances at his command. As we ascend the steps to his front door he pushes aside the escutcheon about the push-button of his door bell and there are revealed two other buttons, one white, the other black. The white one is pushed, and at once the vestibule door flies hospitably open and at the same instant a flood of light is thrown upon us from an electric lamp placed overhead, which enables our host to find his latch key and let us into the hall without any annoyance of waiting outside in the rain. As we are removing our coats the host touches a button in the hall which extinguishes the vestibule light and explains that, had he pressed the button disclosed through the escutcheon as a visitor might, he would not only have thrown open the door and lighted the lamp, but would also have summoned a servant to open the inner door and receive our card; but that the two concealed buttons were for the use of the master of the house, so that he could light his way on entering and extinguish the light on leaving his house.

It is a comfort which those who have never enjoyed it are unable to appreciate, to live in a house which is completely lighted by electricity and in which the switches are conveniently placed. There is no annoyance in searching for matches in the darkness of an unfamiliar room; no constant danger as we light our match to ignite the gas of burning one's fingers or of setting fire to the adjacent draperies. But as we enter each room one or all of the lights may be turned on from the outside. There is no convenience in burning any light longer than it is needed, for with the same ease that a gas jet may be turned up or down an electric lamp may be completely extinguished or brilliantly lighted again. The housewife may delight her friends and family by her dainty conceits of decoration about her lamps and chandeliers with no fear of fires from a breath blowing some light drapery into a neighboring flame. After spending the evening with his reading lamp in exactly the position to suit his eyesight or whim, the master may retire, and by turning a switch at his bedside cut off all current from entering the building.

But our host, who has just ushered us into his library where his wife sits with the children before a blazing wood fire, is possessed of many luxuries besides this great one of complete lighting. There is yet time in the afternoon for a cup of tea before dinner is announced, and the maid soon enters with the tray, which she places before her mistress, and, after adjusting the plug attached to a flexible cord leading from the water kettle into a socket in the wall near by, departs. Then our hostess, having turned on the current by a switch at her hand, asks each his preference as to cream and sugar, and by the time the cups are arranged ready for the tea making, the water is boiling furiously, and soon we sit down for our chat, each holding a steaming cup of tea made from water which has never been approached by fire. As the talk proceeds, touching now upon the rare books, china and silver on the library shelves, the thought occurs to me that extraordinary precautions are needed here to protect against burglars, and, on inquiring concerning this, we find that here also electricity has aided in making comforts for the head which wears the crown of magnificent possession.

Should a door or window or shutter of the house be opened, or a leaf or drawer of a cabinet be tampered with in the night, at once the room intruded upon becomes brilliantly illuminated by a lamp which is set in he ceiling and out of reach to smash; in the master's room a light springs up at the ringing of the alarm bell, and the news of the intrusion is at once telegraphed to the nearest police station. Should the burglar attempt to escape through the house, he must light room after room as he opens the doors.

Against a fire, too, these elaborate fittings have provided whatever protection man has devised against that all-destroying fiend, and it is at least possible to aid the exit of the unfortunate inmates of a burning house. In each room are several of what are called "thermostatic push buttons"—little devices which close and keep closed an electric circuit whenever the temperature of the apparatus rises above a certain amount. When this occurs in any room, at once every room in the house is lighted, bells ring loudly in all the bed rooms, and at the same time the nearest fire alarm box is automatically pulled and the alarm sent in. Help is brought at once, but above all, those who are escaping from the burning building are not still further imperiled by confusion in the darkness.

But as the narration of these wonderful appliances has been completed, dinner is announced, and we are ushered out to a meal cooked, and well cooked, but not by coals on fire. There are no burned spots on the meat, nothing scorched and nothing underdone, but the cooking is rather of the order of perfection of a dinner prepared in the old, evenly heated brick ovens. The electrical baking oven, in which this meat has been so perfectly prepared, is heated entirely from the inside, and by asbestos packing and burnished external surfaces all radiation to the outside air is checked, so that the heat generated is entirely used in the operation of cooking.

External vessels seated on the top of the stove are not generally used in cooking by electricity, but each saucepan, kettle, frying pan, griddle, or boiler, is provided with its own electrical heater, and only while cooking is being done is any current used in a particular utensil. On the table itself the chafing dish is provided with an electrical heating device, and to-night our host turns the current on the coaster for a few minutes to warm the claret which has yet the cellar chill upon it. We find, as we talk of these things, that even the fair daughters bless the advent of electricity at their dressing table, for by its aid they are relieved from the smoke of gas or the annoyance of an alcohol lamp in heating their curling irons, while they are never annoyed by a light which cannot be moved and made to shine in some one fold of the gown.

While we have thus been chatting of these appliances, dinner has been completed, the evening far spent, and we make ready for retiring with the final instruction from our host that we should set the thermostat over our beds at the temperature at which we desire to sleep, and the electrical heater just under the window will warm the incoming air and give us a constant temperature to foster pleasant dreams. We need have no fear of fire or waste of current, for the thermostat will shut off the current as often during the night as the temperature rises above that which we desire.

The successful introduction of the various electrical cooking and heating devices has been dependent upon the invention of apparatus for transforming electrical energy into heat which should be at the same time efficient, convenient to use, and durable. When the "electrical heater" man of 1884 was made the subject of ridicule and the butt of the practical jokers, it was mainly because his apparatus as it existed did not and could not solve the problem. He had packed a lot of German silver wire in powdered lime and was vainly fancying to himself that he was possessed of a practical piece of apparatus. But his wire was large and long, and the protection that he gave it did not prevent its being gradually oxidized and finally destroyed. So that, while he may have contributed to the knowledge of the necessities in electrical heating, it was not a practical commercial possibility till the idea of excluding the air from the hot wire by an enamel baked on it or a coating of cement become developed.

To review the various operations requiring heat and to devise apparatus in which we can use the electrical heater in performing these operations is simply a matter of design, but to day we can say that cooking by electricity is a practically possible thing, which it was not by any means before the invention of a successful electrical heater.

Just here, however, the important question arises of the economy and cost of this radical departure from the ordinary method of procedure in these well-established operations of the household. That there is a real economy of energy I do not believe any one would be able to doubt if the electricity be generated in a station where the engines are not consuming over three pounds of coal to the horse power. For estimating all the losses in the dynamo at about 15 per cent., in the mains at 5 per cent., and in the heating apparatus at not more than 10 per cent., we have a total efficiency of about 70 per cent. of the power of the engine

transformed into heat and used in the cooking by the electrical heater, or, taking into account the efficiency of the engine, approximately 11,000 foot pounds for three pounds of coal, which is an efficiency of about 25 per cent. But even this great loss is much less than can possibly be obtained by firing the coal under a cooking stove, where the best results ever obtained do not give an efficiency of more than 6 per cent. Still we must not forget that the coal which costs us $5 or $6 a ton when delivered into our cellar ready to be consumed in the cooking stove cannot be delivered to us at any like cost when its potential energy has been transformed by a boiler, engine and dynamo into electrical energy and delivered at our cooking table over the mains of the electrical supply company. We must pay for our conveniences in interest on the great plant necessary for their conversion as well as in salaries of all those employed, as also we must reward the capitalists investing in the apparatus by dividends on their stock.

On the other hand, not only have we the actual saving in the trans formation of the potential energy of the coal into heat energy by this chain of changes, but also we must take into account the fact that with an electrical cooking device no fire need be prepared for hours before it is in the proper condition for cooking and maintained constantly after these operations are completed, but the heat rises within a few minutes after the current is turned on, and when the switch is turned off no further current is consumed.

Experiments have been made on the cost of cooking in this manner by an English electrician, and he states in a most elaborate paper the cost of toasting a slice of bread or of boiling an egg, but no such results can be of much value in determining at what cost our own servants are able to perform these operations. That the cost at present is not as great as by gas cooking seems well established, and we may hope soon to have reliable results from the practical operation of some of the recently established electrical kitchens.

But now it is morning, and we must not forget that to day we are to visit our host's office, where he has further electrical wonders for our inspection. Our bedroom lamp lights itself promptly at rising time, and, dressing ourselves by its light, we descend to breakfast, where further use is made of electrical heating in preparing our coffee and eggs; but at last we must bid adieu to the hostess and her ever ready slave, electricity, to visit our friend at his place of business.

He is a busy, hard worked man, and has his office spread over half a floor in one of our tall office buildings; under his control are many sub-departments and numbers of clerks driving along that great mental engine, the financial department of a large business.

Entering the building, we are at first conducted to the basement, where we find an electric light station capable of furnishing lights enough for a small town, but which has only sufficient power for generating the current required in this one building.

While we are admiring the great engines and bright tiled floors and walls of the dynamo room, we must not allow the mechanism of the electric elevators to escape our eyes. There are two styles of these ma-machines near us, operating different cars. The older of the two is arranged like the hoisting engines which are to be seen on every dock and in every freight yard, with the single difference that in place of a steam engine driving the drum on which the hoisting rope is coiled there is an electric motor, the shaft of which is connected with the drum through a train of gearing to reduce the high speed of the armature shaft in order to give the proper revolution speed to the winding drum.

But the later form of elevator mechanism is far more novel, though somewhat resembling the mechanism of a hydraulic elevator. To the shaft of the electric motor is connected directly a very long screw on which is a large nut running between guides and carrying a set of iron grooved wheels. Over these wheels and over a corresponding set of stationary wheels at the end of the machine the hoisting rope of the elevator is passed, making as many complete turns as there are pairs stationary and movable sheaves.

When now the current is turned on and the motor moves, the screw revolving with the armature carries its nut either forward or back. If the motor moves forward and the nut carrying the sheaves moves away from the stationary sheaves, the rope is drawn out between them and the car ascends; but if the direction of the motion is reversed and the sheaves are moved nearer to each other, the car falls just as it would had the power been hydraulic in place of electric. Here, too, in one corner of the cellar, is a large fan driven by electricity, which forces either hot or cold air—according as the register may be turned—into all the rooms of the building through a double set of pipes, through one of which the air passes over coils carrying the exhaust steam from the engine.

But now taking the elevator to our friend's office, we find many conveniences to lessen the labor of a busy day ready at his hand. We at first notice that this desk lacks the usual array of push buttons for calling the heads of departments which are so much in evidence in many desks and are so confusing in a large office. But on our remarking their absence it is at once explained to us that the little dial which we see among the pigeon holes in the front of the desk has the name of every man in the office printed upon it, and, when the pointer attached to the hand over the face of the dial is above a man's name, pushing the button in the center of the dial will call the clerk desired.

"This 'teleseme,' as it is called, is convenient when I wish a man to come to me," explains our friend, "but I seldom use it, for this device here is better." And turning to his telephone he explains the latest desk switchboard.

Many offices have been fitted with telephones from desk to desk with their wires leading to a central exchange where an operator sits to make connections from one to another, but with this device each one has com-plete control of the wires over which he is talking. A contact plug is attached to the telephone, and on the desk is arranged a bank of plug holes and annunciator drops connecting with each man in the office who has a telephone. Pushing the plug into one of the plug holes and pressing a button calls the clerk to his telephone, while, if it is desired that the clerk be not allowed to call his employer, the corresponding aununciator drop is omitted from the employer's desk. In this way a chief may arrange to call or be called by just those of his subordinates he may desire. Should he desire to talk to two or more clerks at the same time, he has but to call them up, and changing his contact plug from one hole to another, talk to each without possible interference from the others who are waiting till he speaks again; thus permitting conversations, consultations and cross-questionings without obliging any of the participants to move from their desks, and without disturbing the telephone communication of the rest of the office.

But the electric dial which tells the correct time being actuated by the great self-winding clock in the hall below, tells us that we have already taken much of a busy man's morning, and now, much impressed by the ingenuity of these devices, great and small, we leave him dictating the letters of the day to his phonograph.

Hardly realizing that this man may yet before the day is out be talking to a business house in Chicago, hearing that his commission given a few minutes ago has been executed in Australia, or writing a letter which is at once reproduced in his own handwriting in Boston. All of this, too, without leaving his office or even moving from his desk.

The Chemist as a Factor in Foundry Practice.

[A Paper read by Mr. H. O. Chute at a meeting of the Western Foundrymen's Association.]

Since this paper was asked for by the Executive Committee several articles on the same subject have appeared in the technical press, and the able address given before the Eastern Association by Wm. C. Henderson, entitled "The Value of the Chemist's Service as Applied to Foundry Practice," appearing in *The Iron Age* of July 13th, and which you have all doubtless read, treats the subject so thoroughly and so well that the writer of the present article decided to confine himself to a few remarks on the possible methods by which the chemist should be utilized in the foundry, feeling that all are now alive to his value and importance. To do this, a short description of the chemist's methods of work in a Bessemer steel works will be given, as illustrating a parallel manufacture and one in which the services of chemistry have been brought to the highest perfection.

With the advent of the Bessemer converter the chemist became a necessity, as its processes could never have been brought to their present perfection without his aid. Previous to this time all branches of the metallurgy of iron were supposed to be mysterious secrets, known only to a few who had inherited in some way this knowledge from their ancestors, and who by long experience had a kind of intuition as to the hidden causes of success or failure. If failure attended one effort the only escape was by guessing the cause and experimenting to find some way to avoid the difficulty. This condition led to extreme conservatism, and the safest plan was to stick by a material and method which was known by experience to give satisfactory results. Expansion, development and improvement were prevented by the impossibility of predicting beforehand the result of a costly undertaking.

Now, however, the causes of the seemingly mysterious differences in iron and steel have been traced to the different elements contained therein, and which, on account of their small quantity, had been previously overlooked. This knowledge has enabled the manufacture of steel to be brought to a strictly scientific basis, and knowing exactly

what is wanted, iron is bought on chemical specifications, and immediately on receipt of material it is tested by the chemist. This test shows exactly its quality, and the user then settles for it, and knows without a doubt exactly its suitability for the required purpose. No trial carloads are necessary, and disputes as to quality are impossible.

When the metal is blown in the converter another change takes place, and its amount and extent are determined by more chemical tests. The steel, being a final product, is tested mechanically by hammering, bending, etc., and any fault revealed immediately requires investigation by the chemist to determine its cause. It will thus be seen how closely the chemist is associated with every operation, how every action is watched and studied at the converter's mouth, how all the causes of success and failure are discovered by analyzing all the materials and all the products all the way through, and analyzing the effect of all the elements on the reactions which take place in its manufacture.

The possibility of determining beforehand and without costly experiment the suitability of material for certain purposes by knowing its chemical composition has enabled the manufacturer of steel to select from the widest possible range of raw materials the most advantageous, has enabled him to secure uniform results and has shown the way to economics which have tended to cheapen the product, enabling him to supplant largely the manufacture of wrought iron and to even threaten the field of the iron casting.

The chemist at the steel works soon necessitated a chemical supervision of the blast furnace, if the pig iron was to be always of the desired composition. This practice soon showed great advantage over the previous imperfect methods, and while furnaces making Bessemer pig iron have a chemist from necessity, many of the furnaces running on foundry iron pay strict attention to the composition of their ores, fluxes, fuels, etc., because of the superior results gained thereby and it may said today that the furnaces are ready to furnish anything desired by the founder.

But why, asks the foundryman, if this is the case do not the furnaces supply us with an iron exactly suited to our uses and thus avoid any necessity on our part for taking up this troublesome question? To answer this and, and to throw some light on the causes of variation in iron from different localities, it will be necessary to examine into the conditions which surround the blast furnaces.

To the furnace accessible to the Lake Superior region an unlimited assortment of the richest ores are always available. But these are hauled a long distance, and by the time they are laid down at the furnace are expensive. The advantages of a rich ore lie in the less freight per ton of iron made, the less amount of fuel used, and the increased capacity of the furnace. Its disadvantages lie in the greater cost per unit of iron, and the probability that it will produce an iron lacking in silicon and hence one that will not carry much scrap and will not correct chill or shrinkage. The other elements of lake ores, such as manganese sulphur and phosphorus, are usually not in sufficient quantity to affect the pig iron materially.

The furnaces near the Connellsville coke have a cheap fuel relatively free from sulphur, and some local silicious ores and cinder. By mixing these with lake ores are produced the irons known as Ohio soft irons and American Scotch. These are well known as being soft and strong irons, which is due to their being free from excessive amounts of sulphur, phosphorus and manganese, and having rather large quantities of silicon.

The furnaces of the South have to deal with an ore which is silicious and carries relatively large quantities of phosphorus and a coke which usually carries more sulphur than the Connellsville. Here, having cheap ores, fluxes and fuel, and cheap labor, they are enabled to run on a lean ore, and by using more coke and flux and keeping the furnace hot produce an iron high in silicon and known as a soft iron and a scrap carrier, but on account of its percentage of phosphorus not very strong.

The furnaces producing "local coke foundry," having high freight rates to pay on ore and fuel, use a rich ore, and with low fuel consumption and a great capacity, make an iron strong on account of its freedom from sulphur and phosphorus, but on account of its relatively low silicon not noted as a scrap carrier.

Lake Superior charcoal, being made from a pure fuel and from especially selected ores, gives an iron particularly free from phosphorus, sulphur and silicon, and on account of its purity being very strong and its tendency to chill gives it great value in particular lines.

It will thus be seen that there are economic reasons for the production of different kinds of iron in different localities, and that to use them to the best advantage an intelligent mixing will be required. But the characteristics of iron from different localities are not always constant, differing not only with particular furnaces, but by the particular conditions at the furnace at the time of making.

The impossibility of always making an iron suitable for a particular purpose and of knowing what kind of iron would run from the furnace until it was cooled and examined led to the divorce of the furnace from the foundry business, the two businesses being formerly combined, as is shown by the fact that the superintendent of the furnace is yet called the founder.

To correct a fault of any particular iron the particular iron must be singled out, the cause of its failure determined from lack of or excess of a particular element, and this remedied by the addition of another iron having a relative excess or deficiency of the same element.

To experiment with the cupola mix till the cause is determined is both tedious and expensive, for, with six or more irons containing six varying proportions of six elements, the number of combinations which ma be made before the right ore is found offers a very inviting field for the calculation of the mathematician, but their contemplation very often wearies the founder. The analysis of the casting here immediately locates the cause of the trouble, and the knowledge of the composition of the irons in the mix allows the offender to be singled out and points the remedy at the same time.

Heretofore the majority of founders have considered that the extent of their business did not warrant their employing the services of a chemist, but the present association offers a great opportunity for mutual aid in this direction by their having a laboratory for their special use, where there would always be the facilities for their individual work, where they could always consult with a specialist on the problems which are always arising, and where work of general value and interest to the trade could always be carried on and the knowledge distributed through the society. Some of the larger foundries have already availed themselves of the services of a laboratory, and the results in all cases have been most satisfactory, although, for business reasons, there would naturally be no great disposition among them to herald its advantages, but some of the notable advances of late, both in improvement of quality and cheapening of product, are directly traceable to this cause.

To avail themselves of the advantages of chemistry it will be necessary for each founder to determine first just what physical qualities are required for his special line of work. This will involve physical tests, and on this subject let the following be quoted: "It must be obvious to all that the actual service to which an article is put when occupying the position for which it was made is the best conceivable test, and as the chemist's knowledge has, in the first place, been derived from and his sole aim is in the last place to meet this test, it might be said that he is wholly independent of tests other than chemical ones. The very utmost which can be hoped from such tests is to determine whether a certain lot of material is good or bad." It may be also remarked in this connection that the founder knows pretty well what he wants in this respect, the main problem being the best and cheapest method of getting it.

The writer wishes to throw no discredit on any physical tests, recognizing their value from a scientific standpoint and in connection with chemical analysis. But of what use is an elaborate system of physical tests alone which reveal nothing for future guidance? If the product is thus tested it reveals nothing as to where the error lies in the mixture, and if the different irons are thus treated, besides the error caused by dissimilar treatment from what would be received in the cupola, there must always be made the false assumption that the physical qualities of an iron would always be transferred to the mixture, the fallacy of which is easily shown by melting a ferrosilicon and white iron together, both being hard and brittle, and obtaining a very soft casting as the result.

As to what chemical compositions will give the best results, the requisites are so varied, depending on the uses to which an article is to be put, that probably the easiest way is to select some of the best specimens and some of the worst, and by analysis determine what elements are required and what to avoid. With these factors determined once for all, there remains the constant attention that is necessary to always know what elements and their proportions are in stock and the ever-varying factors of the composition of fuel, the effect of treatment and others which will constantly arise.

Another thing essential is for the founder and the chemist to get better acquainted and understand each other better. The founder is liable to regard the chemist as an upstart who tries to teach him his business, and the chemist is apt to forget that he deals with but one of the numerous factors which are necessary in the production of good castings, and that without the practical knowledge of the founder as to the handling of the iron, the running of the cupola and the other things necessary in the foundry, the knowledge of chemistry is of no avail. But in this day of specialists it may be conceded that more than one man is necessary to make the best castings.

Finally comes the question, "Will it pay?" The certainty of getting

just what is wanted, or the ability to use anything which is offered cheap without costly experiment, must count for something, and the freedom from attachment to some brands or names which are now paid for at 25 cents to $1 per ton, will be somewhat of a compensation. The lessening of the amount of spoiled castings might also be enumerated. And, finally, the broadening field for the iron casting, through the improvement in quality and uniformity of products, which field seems at present to be narrowing, will be of such vast advantage to the trade that the wonder will be expressed that the advantages were not embraced sooner.

Lighting Estuaries and Rivers.

[A paper read before the International Maritime Congress, by Mr. W. T. Douglass, M. Inst. C. E.]

The lighting of our estuaries and rivers is, I am afraid, a subject of scarcely so much attractiveness as that of the "Coastwise Lights, which have recently been sung by no less a person than Mr. Rudyard Kipling. Yet, important as it is, that our commerce should approach our shores by night and day with the best assurance of safety, it is scarcely less important that it should be conscious of no fresh source of apprehension when once the lights, at estuary or river mouth, have been sighted. It is, nevertheless, matter of common observation among those who take an intelligent interest in the inland waterways for ocean shipping, that their dangers are most insufficiently provided against. And that is a circumstance which must militate in some degree against the commercial usefulness, and, therefore, prosperity, of any estuaries or rivers of which it may be true.

The distinguished Secretary of "Lloyd's" has placed on record his opinion that England's mercantile supremacy is largely upheld by the comparative immunity from peril to life and property which an elaborate and skillfully devised lighthouse system secures for mariner and merchant. Our coasts are approached with confidence, and, therefore, with the more frequency. It is my purpose to show that what has been done for the Channel and the North Sea coasts can also be done for the narrow and often tortuous passages which bring the argosy to the inland port. Yet the system, or want of system at present in vogue in some of our rivers, perplexes and confounds the navigator, while in others, the system of making winding and tortuous passages as safe by night as they may be by day, has been neglected. And modern science, at least, is equal to securing this boon to mercantile mankind, whatever, in other directions, may be the limits of its beneficent usefulness.

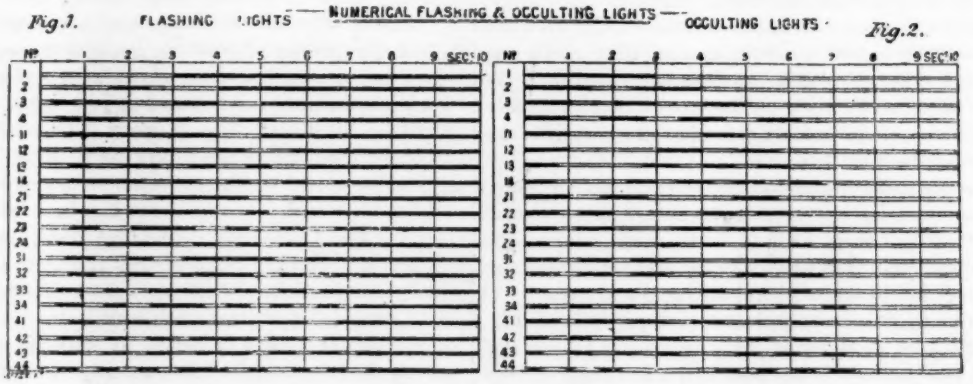
It is important, in the first place, to bear in mind that a very large passenger traffic is carried on by the fast mail steamers, which leave English, Scotch and Irish ports after sundown throughout the year. Many of them, moreover, are timed to arrive at their destination before 6 A. M. on the following morning. The departure and arrival of these steamers, frequently during the darkest hours of the night, must excite an oppressive sense of risk and danger in their commanders, where the lighting of the approaches of the estuaries and rivers is not of the highest order, compatible with the situation. Their anxiety will be, perhaps, almost unintelligible to the lay mind, but it is warranted, and is, moreover, such that the local authorities should pause and thoroughly consider, now that means are at hand and available for placing the navigation of these ports in a state of efficiency so complete that the mariner shall feel that the narrow waters may be navigated, during the darkest night, with the same immunity from accident as under the most favorable daylight conditions.

I am fully aware that harbor authorities are gradually becoming alive to the fact that to increase the traffic of their ports, improved lighting of the estuaries and channels is essential. In most instances, however, obsolete and uncertain lights, with a power of a few candles only, are allowed to remain, and, after several groundings have taken place, and valuable lives have been lost, the local authorities continue calmly to discuss the question of improved lights.

Lest any one may be disposed to think that I am exaggerating the importance of excellence and thoroughness in this matter, I will quote the opinion of Colonel Hozier on the subject of lights and lighting as regards our own coasts in particular: "Perhaps," he writes, "nothing has so materially tended to increase our commerce, give comfort and confidence to our seamen, and stability to our mercantile marine, as the erection of the numerous lighthouses on most of the headlands of Great Britain and Ireland. Before the present excellent system of lighthouses was established, scarcely any vessels of large size attempted to approach our shores after dark." What is true of the greater is true also of the less, and what has so materially conduced to the growth of the commerce of the whole country must help in the development of the trade of any particular part.

Under existing arrangements, where there is a large number of beacon lights in tidal waters, each one has at least its own attendant keeper, an arrangement which appears to be extravagant, since there is no difficulty under suitable automatic working in securing the proper and efficient service of several beacons by the labor of one man, who would be conveyed to them, together with the stores, either by a boat or a steam launch, as the circumstances of the situation might require.

The system in vogue is to be condemned, therefore, because it adds very considerably to the expense of maintaining a station, and thus tends to hinder, owing to considerations of cost, the establishment of necessary additional stations. Under the arrangement which I am about to refer to, it will be possible to obtain much larger results in the direc-



tion of thoroughly illuminating the navigator's path, and at less outlay. The number of men required to supervise and control will be actually less than with the less effective system at present prevalent in several localities. All that is required is that obvious principles of common sense and practical science should be applied to the solution of an interesting and not very recondite problem. As it seems to me, a very brief consideration of the subject by persons versed in maritime science is alone necessary to the satisfactory and easy solution of the question before us.

What appears to be more particularly wanted by our sailors is a definite and clearly intelligible system of illumination, which will enable them at any time during the period of darkness to identify certain positions in their courses with some degree of accuracy. There must be no fear of confusing one beacon light with another, with the lights of vessels, or with lights on the shore. The system should be one that is capable of being established at a minimum of cost, and so be within the means at the disposal of any one of the local authorities concerned. It has been said that many a good ship has been lost for the want of a ha'porth of tar; it is equally true that many a great, beneficent and life saving reform has been at least delayed because of the outlay of money which its inception has seemed to demand.

I will now point out that fixed white red and green lights, exhibited from catoptric or dioptric apparatus, constitute a method of illumination utterly unsuited for our purpose, as they are uncertain in point of distinction, and expensive in point of maintenance, relatively to the power of illumination. Their use has been, to a very large extent, discontinued where the coast lights are concerned, and with good results on the score of efficiency.

Therefore, I have no hesitation in recommending a similar improvement in beacon lights for estuaries and rivers, and especially in view of the fact, which cannot be too frequently insisted on, that we can thus achieve a greater benefit for a more moderate outlay. At any rate, there can be no question that, what has been found too complex for the sea

coast, must fail to fulfil its purpose amid the intricacies and complexities which puzzle the mariner in rivers and estuaries.

I would not for a moment be supposed to wish to assume credit to myself as suggesting an entirely new system of illumination, since so many are in vogue on the estuaries, rivers and canals of the world. He would be indeed an ambitious person who, in the face of this fact, should pose as a discoverer. I am inclined rather to maintain that it would be, if not impossible, at least difficult to suggest any one method that had not been contemplated, or either partially or entirely carried out. Still, I give my preference to a system which has this advantage, that it is economical, practical, easily maintained, and, above all, distinctive.

It will be readily understood that it is impossible, in the limited space at my disposal, to lay down a scheme complete in every detail which shall be available for every estuary or river in the United Kingdom or abroad, since such differences exist that each locality will require special and careful consideration with a view to securing for the mariner the highest possible advantage to be attained consistently with the form of apparatus employed. The system, however, which I have, after very careful consideration of all the circumstances, decided to place before this conference is one that should, in the near future, be adopted by the river and other local authorities, in view of its practical and economical suitability for their requirements.

The system I here recommend has a numerical basis. The number of each beacon is to be read with ease by the navigator. This result will be attained by an automatic transmission of the number at stated periods on the part of the optical apparatus by means of a single flash or of groups of flashes, all of equal period. As generally indicating a main feature in this system, I may here observe that for a vessel entering a channel with the flood tide, the port hand beacons would show even numbers, and the starboard hand beacons odd numbers. This condition of things would be reversed in the case of a ship making her way out of a channel. It will be readily admitted that simplicity in arrangement must conduce materially to the chances in favor of the adoption of the system. It is on these grounds that I limit the period of the light to one of ten seconds, as it is one of sufficient frequency, even in the case of the single flash.

In the first instance it will be sufficient, if we adopt single and group flashing lights, up to quadruple flashing, for the main beacons, since these characteristics will, without introducing color, provide twenty distinctions, the whole of which can be rendered automatic.

Should a necessity arise for the erection of further stations, the quintuple flash may be resorted to, thus increasing the available number of distinctions to 30, which should be considered a safe limit, as a greater number of flash characteristics would tend to a complexity which, in the interests of the mariner, we desire to avoid. The relative amount of light to darkness, which, in the case of flashing lights, will be found to give the most beneficial results, is the arrangement in the proportion of about one-third light and two thirds dark. These limits allow of the bearings being taken with sufficient deliberation, and the periods of eclipse will not be of such great magnitude as to put the navigator off the track of his guiding star.

A light, such as I have described as No. 1, would naturally have more power in the beam than Nos. 2 to 4. It is then expedient to place No. 1 at the seaward station, Nos. 2, 3, 4, etc., following on consecutively to mark the main points of land or sand banks and rocks to be avoided, and the turning points in the tortuous channels. Red cuts have frequently been advocated for this purpose, and their installation is to be strongly recommended in certain instances. It is found, however, to be absolutely impossible to arrange these cuts to meet the conditions of a very narrow channel, where navigable water, of a few fathoms only in width, constitutes the deep water passage, and is probably bounded by dangerous banks.

In the daytime the navigable river is, apart from the beacon lights, usually defined with care by buoys, perches and beacons. It will therefore be readily admitted that these intermediate and accessory buoys, perches and beacons, whose positions become known by daylight, are of even greater importance as guides by night, and consequently that their presence should be very clearly defined to obviate the groundings which take place.

In order that these intermediate and accessory aids to navigation may have a definite value by night, and be, at the same time, entirely distinct in point of character from the main beacon lights, I propose that they should be of the occulting class, or of a character entirely the reverse of flashing, but arranged in the manner described for flashing lights, reserving even numbers for the port hand lights, and odd numbers for those on the starboard hand.

For marking middle grounds, yet a further distinction is desirable, and the requirements of these situations can most readily be met by the introduction of dioptric apparatus of "the fixed and flashing type," and thus indicating either the port or starboard hand.

The adaptation of these forms of light, whether wholly or in part, to the seaward end of our breakwaters and harbor piers, to spit and river buoys, has met with much approval, and I am persuaded that their further extension and application, combined with the numerical system, is likely to produce results of great and obvious utility.

The only task which is imposed by this system upon the mariner's faculty of quick observation, is the noting of the number indicated by the flashes, which I shall presently show will not be beyond the capacity of any seaman. As soon as the number is perceived, the master of the vessel which is moving through the lower reaches of the river, or between the submarine mud or sand banks of the estuary, will know exactly where he is. He will have a plain indication of the precise measure of progress he has made held out to him. The lights thus characterized will play the part of numbered milestones on a country road, which suddenly help the wayfarer, puzzled by mazes of wood and green field, to fix accurately his position with reference to an embarrassing topography. The language of numbers is a universal one, and 4 and 14, indicated by flashes, conveys an identical meaning to the master of the Chinese junk, the captain of a French *chasse-maree*, or the skipper of a north country whaler. As everybody knows, color blindness is a human infirmity which those who are responsible for the safe ordering of our maritime concerns have to take into account.

It will, moreover, be found of very great advantage to be able to dispense with the use of color for distinctive purposes without any reference to the loss of light which its introduction entails—viz., 40 per cent. with the red light and 70 per cent. with the green light. Under the numerical system, with its lucid flash indications, there is less risk that the imperfections of man's vision will be productive of misconception and consequent disaster. It is, therefore, admirably adapted for universal adoption, and might easily become a luminous and most useful Volapuk for those concerned in a difficult and dangerous navigation. Cheapness in production, universality in usefulness and simplicity in conception, are surely no mean qualifications for success.

The installation of efficient optical apparatus of the kind indicated is not necessarily a matter of great expense, since the range, in the majority of cases, is so short. Flashing apparatus of the fourth, fifth and sixth orders may with advantage be utilized, and further, they may be of the self-contained type (*i. e.*, without lanterns) where port funds do not admit of the illuminating apparatus being placed within lanterns of ordinary construction.

With improved oil and gas burners of the most recent type installed in dioptric apparatus, having a vertical angle of 80° and a horizontal angle of 60°, the beam of light available to the mariner is equal to nearly 4,800 candles in the fourth order, 1,700 candles in the fifth order, and 1,100 candles in the sixth order, which would appear to suffice for the purposes here recommended.

The experience gained in this country and abroad, where small automatic lights have been erected, tends to show that their introduction so far is attended with a large degree of success, both on shore and afloat, and the number of stations thus illuminated is constantly being added to by reason of the low first cost of the installation and its subsequent maintenance.

Let us now turn to the consideration of the illuminant. Compressed oil gas undoubtedly holds the foremost position as the source of illumination for estuaries and rivers, when beacon lights are arranged for automatic working. This pre eminence is due to its handiness in transport, its storage capacity under pressure, its general cleanliness, and its cheapness, where manufactured on a comparatively large scale.

Again, as an illuminating agent, it occupies a foremost place, and when mixed with a proportion of pure oxygen, which is now a commercial custom, its illuminating power is increased at the sacrifice of a moderate additional outlay.

Oil burners have lately been introduced for burning continuously with a special preparation of mineral oil. The economy of this source of light may possibly lead to its general adoption in the future, but our experience of it in continuous working is too limited to permit us to form a definitely favorable opinion of its efficiency.

The nightly attendance required at lights, where mineral oil is consumed under ordinary conditions in the burner, will prevent its general application for the purpose of illuminating estuaries and rivers where the lights are situated at some distance apart at inaccessible situations. Its use, however, where a lightkeeper is constantly in attendance, is to be encouraged.

Electricity, in the form of incandescent lamps, is a source of illumin-

ation which has many advantages, where the central station is not too far distant from the beacon lights, and more particularly where the central station is in the hands of port authorities. In New York Harbor the electric light is employed to define Gedney's Channel; here 100 candle power lamps of the incandescent type, with three loops in its filament, are attached to spar buoys placed 1,000 feet apart.

In conclusion, let me observe that, when the large portion of the world's commerce, which is continually moving up and down the waters of our rivers and estuaries, is borne in mind, we cannot help the conclusion that everything that possibly can be done, should be done to facilitate its ingress and egress into and from our inland ports. Systematic, and not piecemeal treatment of so important a question is imperatively required. If my proposals seem to fail in perspicuity and thoroughness, let others take the matter in hand and make their suggestions. At least, let us not stand idly by and allow great interests to be hampered and valuable lives to be lost, while we hesitate and weigh the *pros* and *cons* of this and that scheme. I have made an attempt to meet a great and urgent necessity, and I place my recommendations at the disposal of the Congress, in the full conviction that they contain in themselves at least the germ of a system which must prove of vast and far reaching benefit for our mercantile marine.

Toronto's Gas Consumption, with Description of New Holder Nearing Completion.

[From *Toronto World* of July 20, 1893.]

General Manager Pearson wears a pleased and contented countenance these days in spite of the hot weather. He is opposed to Sunday cars, and of course he thinks it is many years before Toronto will see the festive trolley bounding along the streets of our city on a Sunday. Like many other good people, however, he is off his trolley on this question and will not get on again till August 26, when a great heap of cobwebs will be swept away from before his mental vision. But we were talking about Mr. Pearson's happy countenance just now. That is not the result of his anticipations of defeat for the Sunday car people. Mr. Pearson is happy over the gas business as it exists to day in Toronto. Never before was there so much gas consumed in Toronto as there is to day, and never were the prospects more promising for a big consumption in the future. The Directors a few months ago made a considerable reduction in the price of gas, bringing the rates down to $1 for illuminating and 90 cents for cooking purposes. The result has proved eminently satisfactory to the Company. During last month alone 500 additional cooking stoves were connected with the Company's pipes, and are drawing their daily supplies from the Company's main. People are now using gas to cook both summer and winter. Gas is recognized by those who have used it at present prices as the cheapest and best cooking medium in the field, and the Directors are looking forward to a large and continuous increase in their business from this source.

Mr. Pearson is busy keeping up with the procession. A large part of his time is consumed in providing plant to meet the demands of the immediate future. It is only five years ago since the first large gasholder was constructed at the foot of Bathurst street. This holder has a capacity of 1,160,000 cubic feet, and up to the present time was by far the largest holder in Canada. It was built by an English firm, Messrs. C. & W. Walker, and is a splendid piece of work, massive and of thorough workmanship. The holder is telescopic, which is operated in a tank 150 feet in diameter by 35 feet 9 inches deep, and is composed of two sections, each 35 feet in height and 146 feet in diameter respectively. The total height from the ground to top of crown is 77 feet. The guide frame for this holder is composed of 16 standards, each 74 feet in height. The guide frame is the outer part of the structure, and consists of a skeleton steel framework, up and down which the holder moves according to the quantity of gas contained within.

Large as this English holder is, it is inadequate with those previously constructed to supply the increasing demand for gas in the city of Toonto. The Company have for the past 15 months been engaged in erecting a second holder at Bathurst street that will have a far larger capacity than the former. It towers 112 feet above the ground, being 35 feet higher than the one alongside it. Its capacity is 1,750,000 cubic feet, or about 50 per cent. larger than the other one. This is the largest holder in Canada, and there are not many larger than it in the United States. It was in June of last year that Mr. Pearson began the work in connection with the building of the monster. The first thing in building a holder is the excavation of the tank or pit and the building of the brick walls surrounding it. Imagine a big pit 150 feet in diameter and 35 or 36 feet deep, and you get some idea of the immensity of the work. Mr. Pearson himself is the designer of the tank. He superintended the building of it and it was constructed by Mr. W. C. Whyte of New York, who has built nearly 100 tanks, and is an admirable piece of workmanship. In the construction of this tank 5,000 barrels of Portland cement were used, and this was furnished by the Owen Sound Portland Cement Company, and was pronounced by Mr. Whyte the best he had ever used. In early Spring everything was in perfect shape for the contractors who built the guide frame and holder. The contractors for this work are Messrs. R. D. Wood & Co., of Philadelphia, who took the contract away from seven English and two American competitors. As regards price, the other contractors were not in it with Messrs. R. D. Wood & Co. This firm use much less steel in the skeleton guide frame than the others. They claim to build the frame on more scientific principles, using less material, but so disposing of the various parts as to secure the utmost possible strength. The new framework looks much more slender than the one built after the English fashion, but Mr. Pearson is satisfied of its strength and superior scientific construction. All the work was prepared in Philadelphia during the past Winter. The steel was imported to Philadelphia from England, and in spite of this fact the American firm were able to do the job much cheaper than the English contractors. The work of construction was begun in Toronto on May 15th. The whole job is pretty nearly completed now. It will be handed over to the Company by August 1st. It will thus have taken only about two and a half months to put the gigantic structure into shape. The work of construction here is under the charge of the company's engineer, Henry A. Carpenter, of Philadelphia. Mr. Carpenter is a young man indeed to have charge of so important a work, but he understands his business thoroughly, and the way in which he pushes the work and superintends all details is proof that the Company could not have eas ly secured a better man for the purpose.

The suspension frame in this holder consists of 16 latticed columns 108 feet high, with 3 rows of box girders between each 2 columns. The holder is of 3 sections, each 35 feet in height, and the diameter of these sections runs from 144 feet for the inner one to 148 feet for the outer one. There is a rise of 7 feet in the crown of the inner section, making the total height of the structure, as stated above, 112 feet. The Philadelphia firm makes a practice of using no bolts in the construction of the guide frame. All pieces are put together with hot rivets, by which means the whole concern is rendered much stronger and as if one piece of steel.

The cost of the work in connection with the new holder, including the tank, is in the neighborhood of $100,000.

The gas that supplies the Bathurst street holders is conveyed from the works in Parliament street by a separate 20-inch main about two miles in length. The gas is forced into the holders by means of an exhauster of 50 horse power. This exhauster will fill the holders at the rate of 200,000 feet an hour. There is a duplicate engine and exhauster for use in case of accident to the one ordinarily used.

The holders in Bathurst street are designed to supply the western and central districts of the city.

Mr. Carpenter corroborates Mr. Whyte's statement regarding the quality of Portland cement and says it is the best cement he ever used. It is the only cement he ever found into which he was unable to drive a spike.

After August next, the total storage capacity of the Company will be neary 4,000,000 cubic feet. An idea of the size of the new holder may be judged from the fact that the largest holder in Montreal is only about 600,000 feet, or less than one-third of the capacity of the new one in Bathurst street.

In speaking of the consumption of gas in Toronto, Mr. Pearson states that there is a big increase every year, but just now it is especially large. He anticipates it will not be more than three or four years before they will again have to take into consideration the enlargement of their present storage plant. He is of opionion the next holder will be erected some place in the East End.

He is just now figuring on erecting an independent gas plant on the Island. He is conferring with the city officials as to a site. Such a plant will cost about $40,000. A gas supply on the Island will fill a long-felt want. One of the greatest drawbacks to living on the Island is the fuel problem. Wood costs about $8 a cord, and is a nuisance at that. The Gas Company ought to find it a profitable venture to extend their operations to the Island.

The Company has been fortunate in securing so convenient a site as that acquired at the foot of Bathurst street. In addition to having room for their two large holders there is ample space for erecting a water gas plant of 3,000,000 capacity, which will be required ultimately for the West End.

A comparison of the business of the Consumers' Gas Company of Toronto with that of other companies is interesting. The output of the Toronto company last year was 560,000,000, or 30,000,000 more than was produced in Montreal. The prices in Toronto are $1 and 90c. as compared with $1.30 and $1 in Montreal.

Hamilton uses 60,000,000 feet per annum, and pays $1.50 to $1 per 1,000 feet therefor.

Buffalo has three companies and uses about 500,000,000 feet. The average price is $1.20 for illumination and $1 for cooking purposes.

In Boston gas is sold at $1, and in Cincinnati at the same figure.

The annual output of Milwaukee is 575,000,000 feet, about the same as that of Toronto. The price there is $1 and 80c. per 1,000 feet.

In St. Paul they use 250,000,000 feet and the cost is $1.70 and $1.50.

Washington uses 800,000,000 feet. The price is $1.25 per 1,000.

In Cleveland, the State Assembly recently interfered in the price of gas and brought the price down to 80 cents. This is the lowest price in America.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. MICHAEL J. LEYDEN has resigned the Superintendency of the Schenectady (N. Y.) Gas Light Company, the withdrawal to date from September 1st. In all probability he will be succeeded by Mr. W. C. Thomson, of Spartanburg, South Carolina.

WE regret to report the death of Mr. Joseph Gibson, late Secretary and Treasurer of the Nashville (Tenn.) Gas Light Company. At a special meeting of the Board of Directors of the Company the following preamble and resolution were adopted:

Whereas, The Directors of the Nashville Gas Light Company have assembled to take into consideration the untimely death of their late Secretary, Mr. Joseph Gibson, and to pass appropriate resolutions in respect to his memory; therefore, be it

Resolved, That in the death of Mr. Gibson the Company has lost one of its most valued officers. He has been in the employ of the Company for 18 years, and had worked up from general bookkeeper to the Secretaryship, the most important and valuable and also the most responsible position in the Company. The Board can conscientiously assert that they cannot say too much in his praise. He was a man almost without a fault. Not of a robust physique, and for many years quite an invalid, he has displayed a degree of energy and devotion to duty which seemed to have been the guiding principles of his nature that was simply admirable. His modesty was a fitting accompaniment to his fidelity and his integrity. If he had a fault it was in that delicacy of feeling which prevented him from asserting himself. A man of never large means, but who was of a most charitable nature; one who in schemes of public good, or where his sympathy was enlisted, "set tens where others units write." There are these among us who have been associated in business with him for nearly a generation who can truthfully say they never heard him speak a word or do an act that they can criticize. His family, whose idol he was, mourns his loss, the community has lost one of its most upright and exemplary citizens, and this Company its most valuable and esteemed officer.

THE offices of the Youngstown (Ohio) Gas and Electric Light Companies have been removed to the premises on North Market street, formerly occupied by the Palmyra Coal Company. The Company's patrons will appreciate the change.

JOHN BROSNIHAN has brought suit against the Worcester (Mass.) Gas Light Company for damages in the sum of $4,000. Plaintiff bases his claim on the assertion that, while in the pay or employ of the Company, he was digging a trench near the corner of June and Pleasant streets, Worcester, and that a flying scrap of iron, negligently cut off from a pipe by another employee of defendant, struck him in the eye with force sufficient to rupture that organ.

MR. HOKE SMITH, U. S. Secretary of State, has received the annual report of Mr. S. Calvert Ford, Inspector of Gas and Meters for the District of Columbia, for the twelvemonth ended June 30. The average illuminating power of the gas supplied by the Washington Gas Light Company during the year was 17.99 candles—the maximum having been 20.21 candles and the minimum 16.01 candles. The average quantity of ammonia per 100 cubic feet was 1.70 grains and the average quantity of sulphur was 7.41 grains. The average specific gravity of the gas was .662, and the average pressure of gas during the hours the street lamps were lighted was 1.45 inches. The average illuminating power of the gas supplied by the Georgetown Gas Company was 16.68 candles; average quantity of ammonia, 2.07 grains; average quantity of sulphur, 17.43 grains. The gas supplied by this Company was on three occasions of less than the standard illuminating value of 16 candles. On six occasions the quantity of ammonia found exceeded the 5 grains allowed, and on 18 occasions the quantity of sulphur exceeded the 20 grains allowed. The average pressure of the gas was 1.53 inches. The average specific gravity was .427. During the year the office inspected and proved 1,410 meters, with the following results: 94 registered fast, with an average error of 3.79 per cent.; 39 registered slow, with an average error of 6.27 per cent.; 2 did not register at all; and 1,272 registered within the limits allowed by law. The sum of $705 was collected for the meter inspections. The gas supplied by the Washington Gas Light Co. averaged practically two candles in excess of the illuminating power required by law. Numerous complaints were made during last winter owing to a want of supply occasioned by what is commonly called "dry stoppage," indicating that the pipes were choked with naphthaline. No defaults in the illuminating power and purity standards of the gas supplied by the Washington Gas Light Company occurred during the year. The gas supplied by the Georgetown Gas Light Company is manufactured from coal, and although the illuminating power was found to average only 16.68 candles, it appeared to have given general satisfaction. This Company having laid large mains in several of the principal streets during the past year, the supply will be much improved. The defaults were less than the preceding year, except in sulphur, the latter defect being due to limited purifying capacity, but this is being corrected by the erection of larger purifiers. The provisions of the act approved March 3, 1893, authorizing two additional laboratories to be established in Washington, are being complied with, and suitable sites have been selected and approved, corner of 5th and D streets, southeast, and at 1335 Fourteenth street, northwest. It is thought that the two laboratories will be completed and in working order about September 1st. The laboratory in Georgetown, located at 1,338 32d street, has been in operation some time. Other provisions of the act are in operation. The Inspector renews his recommendation for the increase of the salary of the messenger in the office, as his work in the laboratory, in addition to his regular duties, entitles him to the increase.

AT the annual meeting of the Ipswich (Mass.) Gas Company, the following officers were chosen: Directors, Joseph Ross, George E. Farley, Charles W. Brown, John A. Blake, and T. F. Cogswell; President, Joseph Ross; Clerk and Treasurer, George E. Farley; Manager, Chas. W. Brown.

THE following is the text of the decision of the Board of Gas and Electric Light Commissioners, in the matter of petition for an order amending the gas rates at Brookline, Mass.: "Since September 30th, 1889, the price of gas supplied by the Company to ordinary consumers has been $1.90 per 1,000 feet. On the 27th day of February, 1893, the Company entered into a contract with the city of Boston, by the terms of which it undertook to supply, after July 1st, within certain sections of the city, gas for street lights at 70 cents, and to private consumers at $1, and in the Brighton district at $1.25 for street lights and $1.50 to private consumers. At the same time the Company voted to supply gas to private consumers in Brookline at $1.50. The petitioners urge that they should have gas at not more than $1 per 1,000 feet. But little effort was made by the Company to justify the discrimination in this case, except by an intimation that it was fairly based on a difference in cost of distribution caused by the difference in density of the gas consuming population. It is very doubtful if any such difference in cost could be shown to exist, and if any did appear, it would probably be found too small to have any appreciable effect upon the selling price of the gas. Certainly the difference in this case is too great to be justified upon such grounds, since it is more than three times the entire cost for distribution. But while such discrimination may appear to be unjust, it is by no means clear that it is illegal, and it is not in every case of discrimination that either this Board or the courts can interfere to prevent or adjust. Whether this Board can prevent this discrimination depends upon whether it has the power to reduce the price in territory named to $1 per 1,000 feet, and pay a fair dividend upon the capital necessary for the business. Unless it can do this, no power exists either in this Board or elsewhere to compel it to supply it at that price. The Board cannot assume merely because the company offers to supply gas under existing conditions in Boston at $1 per 1,000 that it can fairly afford to supply it at that price, either there or elsewhere. All the evidence in the possession of the Board tends to show that until the conditions shall be greatly changed, the Company cannot be legally required to supply gas in any portion of its territory for $1 per 1,000 feet. All its accounts show that at this price is

less than cost, and would provide nothing for either interest or dividends. The Board has considered its duty to be to ascertain, without reference to any of the prices named in the contract, at what price the Company might fairly be required to supply gas within the territory of the petitioners. If the Company sees fit to carry, for any length of time, real estate not suitable for the business of supplying gas, and which it never intends nor expects to use for such business, it would seem fair that the burden of such ownership should be borne by the property itself, and not by the consumers of gas. It may well be claimed that the Company is under obligation to its consumers, having disposed of such property, to apply the proceeds to a reduction of its capital. It was admitted that the success of the supply of gas in Boston by this Company was problematical and that this feature of its business was purely speculative and its results uncertain. Prior to entering upon the expenditure necessary under the Boston contract, the bond and share capital of the Company was $1,000,000. Deducting from this the investment in the electric business and in the property abandoned, the capital employed is still high, relative to the Company's output, very much higher, indeed, than in the case of any other Company within the Commonwealth with which it may fairly and properly be compared ; higher, with one or two exceptions, than any other dividend paying Company. Apparently the Company has been burdened through a considerable portion of its history by a lack of economy in its management, since the prices charged for gas in the past seem to have been sufficient to provide a liberal profit. In view of these facts, the Company probably does not expect to pay, and would not claim to be entitled to pay, as large a dividend as those Companies which have pursued a different and more conservative course with respect to development of their capital. The price suggested is based upon these considerations, and, in view of the entire history of the Company, seems fair and just to all concerned. The Board confidently believes that with the proper improvement possible in respect to management and leakage, and the entire cost of the gas thereby reduced to the lowest point which can reasonably be demanded by the Company, the Company will be able to earn a fair, though moderate dividend upon the capital actually invested for the supply of gas in Brookline and Brighton. The Board recommends that from and after the 1st day of October next the net price for gas supplied by the Brookline Company shall not exceed $1.40 per 1,000 cubic feet."

THE Cleveland *World* says that Cleveland will get $18,418.08 as its percentage of the receipts of the Cleveland Gas Light and Coke Company for the first six months of 1893. The Company's statement, submitted to the Director of Accounts towards the close of July, shows that in the last half year 341,193,900 cubic feet of gas were manufactured and sold, the gross receipt therefor being $283,355.12. The Peoples Company's contribution to the city, on account of gas sold during the same period, will amount to about $6,000.

AT the annual meeting of the Lowell (Mass) Gas Light Company, Messrs. Sewall G. Mack, Levi Sprague, Jacob Rogers, John F. Kimball, Alexander G. Cumnock, George S. Motley and Edward M. Tucker were chosen Directors. Mr. D. Bradford Bartlett was elected Clerk and Mr. Jacob Rogers Treasurer.

AT the annual meeting of the Pittsfield (Mass.) Coal Gas Company the retiring Board of Directors was re-elected, save that George H. Tucker was named to replace the late Daniel J. Dodge. The management also authorized the announcement of a decided cut in the gas rate, the same to take effect on October 1st. The new net rates are as follows: A monthly consumption of less than 1,000 cubic feet, $1.90 per 1,000 ; 1,000 cubic feet to 25,000 cubic feet, $1.80 per 1,000 ; 25,000 cubic feet and upwards, $1.50. For a supply of fuel gas, through separate meter, the rate is $1.50. These are very reasonable rates, when the circumstances governing the gas business at Pittsfield are all considered ; and it is pleasing to be able to add that the output steadily increases.

WE regret to be called upon to chronicle the demise of Mr. E. U. Slade, Superintendent of the Hackensack (N. J.) Gas Light Company, which sad event occurred on the morning of Wednesday, August 2d. Interment was made at Hackensack on Friday, August 4th. Deceased was a brother of Mr. James Slade, Superintendent of the Yonkers (N. Y.) gas works, and an uncle of Mr. R. E. Slade, Superintendent of the Citizens' Gas and Electric Company, of White Plains, N. Y.

THE Berlin Iron Bridge Company, of East Berlin, Conn., has been awarded the contract for the new power station for the Atlantic Improvement Company, Astoria, L. I. There will be two buildings, a boiler house, 62 feet wide and 85 feet long; with a dynamo room, 70 feet wide and 130 feet long. The dynamo room is controlled by a travelling crane to be furnished by the same parties.

A MOVEMENT is under way at Logansport, Ind., for the formation of a new gas company.

THE Salt Lake and Ogden (Utah) Gas and Electric Light Company, on August 2d, gave a mortgage in favor of the Farmers' Loan and Trust Company, Trustees, to secure the payment of 1,500 six per cent. 25 year bonds, of $1,000 each, or a total of $1,500,000. The bonds are dated January 1, 1893, and run to January 1, 1918, and the mortgage covers the property and franchises of the Company in Salt Lake and Weber counties.

TREASURER F. N. PARSONS, of the Franklin Falls (N. H.) Gas and Electric Light Company, in furtherance of the proposition to install an incandescent electric light plant, has published the following notification to the residents of the town : "The lights will be put in if a reasonable number of consumers can be assured. The charge for lights will be on the basis of 1 cent per hour for each light while in use. All inside wiring will be at the expense of the consumer. All who desire lighting by electricity should inform the Superintendent, W. L. Whittier, at as early a day as possible, giving the number of lights desired."

AT the annual meeting of the Greenfield (Mass.) Gas Light Company the following officers were elected : Directors, W. N. Washburn, F. R. Allen, W. A. Forbes, F. A. Pond and Jas. D. Safford ; President, F. R. Allen ; Clerk and Treasurer, Dana Malone. A dividend of 2 per cent. on the common stock was declared, the preferred stock sharing in a division of 3 per cent.

THE nomination of General Morris Schaff to succeed Mr. Charles A. Towne on the Massachusetts State Board of Gas and Electric Light Commissioners has been confirmed by the Governor's Council. Mr. Lawrence S. James has also been appointed first assistant inspector of gas and gas meters.

A COMMITTEE to investigate the different electric light systems, with a view to installing a plant of that sort, to be operated on municipal account at Smyrna, Del., has been appointed. The members thereof are Messrs. Jas. C. Robinson (Chairman), William Faries, O. B. Voshell, W. M. Lewis and J. H. Hoffecker.

THE Board of Arbitrators appointed to determine the value of the Macon water works system, now and hitherto operated by the Macon (Ga.) Gas and Water Company, which the city desires to take over and operate on public account, report that a fair valuation of the same is represented by the sum of $550,000. The next step will be to call a general election to decide whether or not the people are willing to issue bonds to buy the water works at the arbitrators' valuation, and there must be a two-thirds vote of the electors in assent. If the two-thirds be not obtained the election goes by default, the bonds are not issued, and the 20-year contract now existing between the city and the Company remains in force. The city was authorized by law to make a 20-year contract with the Water Company.

AT a meeting of the Parks and Gardens Committee, Toronto, Canada, the following letter from Mr. W. H. Pearson, General Manager and Secretary of the Consumers Gas Company, of Toronto, was read—Island Park is a suburb of Toronto :

"JOHN CHAMBERS, ESQ., Park Commissioner, Toronto :

"Sir—I yesterday (July 27th) received your letter asking what chance there would be of this Company supplying the Island with gas. In reply I am authorized by the Directors to say that if a sufficient number of the Island residents and leaseholders would agree to use gas to such an extent as would bring the Company in a very moderate return for the investment, and the Company were granted a lease of a suitable property on which to erect a works, say 200 by 100 feet, at a nominal rental, for the usual term of 21 years, renewable, they would feel inclined to put up works so as to be in a position to give a supply of gas by the commencement of next season. As it will cost something like $40,000 to erect a suitable works and lay pipes of a sufficient capacity, the Directors do not see any prospect of the business paying for a number of years, and as the introduction of gas would be so manifestly to the advantage of the city, in making the Island a more desirable place of residence, and thereby increasing the value of the city's property, they consider the city should meet the Company by granting them a lot on the terms named. Owing to the smallness of the consumption the Company could not be expected—at all events for a good while—to supply gas to the Island on the same terms as the city, but they would do

so at $1.50 per 1,000 cubic feet, and I am making my calculations on that basis. I shall be glad to hear from you at your earliest convenience, as we shall require to commence operations immediately, in order to be ready for next year. Yours truly, W. H. PEARSON." In the discussion that followed, Commissioner Chambers recommended that the Company be granted a site immediately to the northeast of the electric light building at Center Island. The plot is now under water, and the necessary filling would have to be completed by the Company. The Committee eventually decided, on motion of Ald. Leslie, to grant the site on the terms asked by the Company. An amendment offered by Ald. Burns that the site should be rented at a valuation to be fixed by the Assessment Commissioner was defeated.

A BILL in equity was filed on Aug. 4 in Washington, D. C., by the American Gas Company, of Kentucky, which concern has a branch office at 604 Fifth street, Washington, in charge of its Vice-President, John E. Carpenter, to annul its contract with the General Gas and Iron Company, of New Jersey, which also has an office in Washington at 1736 N. street, under charge of Wm. H. Harris. Last March it is alleged that the American Company agreed to sell to the General Company its plant, engines and implements, located on the grounds of the Hygienic Ice Company, for 250 shares of stock in the latter Company, the only condition being that the purchasing Company should remove the plant within six months, and set it up in working order at some place in connection with the pipe lines for the general distribution of the gas manufactured. Before the contract was carried out the American people aver that they found the stock of the General Company to be absolutely worthless, and recalled the deal. The General Company, however, proceeded to take possession of the plant, which it had purchased for the 250 shares of stock quoted at one cent. per share. The plant is worth $5,000; and accordingly the American Company is anxious to recover it. General P. W. Hardin is President of the American Company, and among the leading stockholders of the General Company are Franklin Edson, E. D. Woodruff, Wm. H. Harris, J. S. Mitchell and John W. Trim.

THEY are still tinkering at the proposed ordinances to govern the supply of gas at Detroit, Mich. The latest proposes a maximum gross rate of 90 cents per 1,000 cubic feet, prompt payment to secure to the user a rebate of 10 cents per 1,000. The Company is to pay to the city 5 per cent. per annum on its gross receipts, the books to be open to the inspection of the City Comptroller. It is also specified that natural gas shall be supplied at a rate not in excess of 33 cents per 1,000 cubic feet.

Causes of Fires.

[Abtracted from a Paper by Mr. C. J. Hexamer.]

I wish to call particular attention to the fact that the explosiveness of light petroleum products cannot be effectively lessened or neutralized by adding various substances to them. Numerous claims have been made for substances intended to be added to gasoline and the napthas to reduce their explosibility. So far as I know, there exists no substance which even to a slight degree lessens the inflammability of petroleum and its products. A stop should be put to the sale of such humbugs. The writer, in his experience as an expert, has frequently found that people have become negligent and exceedingly careless in handling the light petroleum products, believing them to have been made safe by such additions. As a good thermometer is not accessible in every household, the simple test of pouring a few drops of the oil in a saucer and applying a match near the surface will suffice. If the material readily flashes and burns, reject it as unsafe.

In order to decrease the danger from lamps, so-called safety lamps have been invented. These are made of glass, enclosed in metal cases, which protect the glass receptacles. Westland's lamp has, experimentally, proved successful, although the writer has no further evidence of how it has worked in practice. This lamp consists of a globe of glass, containing the oil, surrounded by a concentric sphere, containing water charged with carbonic acid gas under pressure. As soon, therefore, as the lamp is broken, carbonic acid gas is set free, tending to extinguish the flames.

Hanging lamps should be suspended from metal chains, and not from cords, for should the fibres burn through, the lamp falls. Kerosene lamps should be filled in daytime only. Never attempt to fill a lamp while it is burning, or near an artificial light or fire. No flame, be it gas or oil, should be nearer than eighteen inches from bare woodwork at the sides and thirty six inches from the ceiling.

Gasoline stoves are exceedingly dangerous and should not be used. In country residences, gasoline vapor, or, as it is frequently called, gasoline gas, is sometimes used. Where gasoline machines are used, the apparatus, especially the carbureting arrangement, should be placed at least 50 feet from all other buildings. The gas machine building should be on a piece of ground lower than the other buildings, so that the gasoline vapor which may escape, and which is heavier than air, may flow away from the buildings. Carefully see to it that all supply pipes descend towards the machine building, so that any vapor which may have condensed in its passage from the carbureter to the dwelling may flow back into the carbureter. Care must be taken to have a drip cock attached to every jet, so that the pipes may be well emptied of gasoline before lighting the vapor. Gasoline vapor is extremely explosive and dangerous.

Tests of Mine Safety Lamps.

In a paper on this subject, read by Mr. William West before the Central Mining Institute, of Western Pennsylvania, the author remarked:

After the Mammoth explosion the H. C. Frick Coke Company abolished the open lights in all its mines in the Connellsville region below water level, causing at that time a demand for safety lamps in excess of the supply. The result was the putting of a great many poorly made lamps on the market. At the Frick these inferior lamps have been replaced with better made lamps, and at the present time all our pillar and stump drawing is being done with lamps having a metallic cover over the gauze. The common Davy lamp is still used by the fire bosses for examination purposes only.

For the last couple of years I have been anxious to have the Davy and Clanny lamp tested in a strong current of explosive mixtures and see for myself whether or not the burning gas could be blown mechanically by the current through the apertures of the gauze before its temperature was sufficiently reduced to prevent the ignition of the gas on the outside of gauze. I was also anxious to see if a red hot wire gauze would fire gas on the outside of the lamp and cause an explosion.

During the last summer we had conditions favorable for getting some practical information on the subject.

A captive feeder in the bottom at the entrance of a chute between a couple of parallel butt headings furnished the gas. The first test was made with a common Davy lamp in daily use, the velocity was 5½ feet per second, the flame on the lamp wick was one half inch in length, the gas burned in the lamp until the gauze became red hot and fired the gas on the outside of the lamp. A Clanny lamp without a shield was then tried in the same current; four times out of six the flame on the lamp wick went out, but the gas kept on burning up in gauze above the glass cylinder and would have made the gauze red hot and caused an explosion on the outside of the lamp if it had not been removed. In the other instances the flame in the lamp became extinguished, when the gas exploded in the lamp. The Davy lamp was then fitted with a new gauze, carefully examined with a magnifying gless placed in position and the velocity increased to nearly 11½ feet per second. The gas on the outside of the lamp fired almost as soon as the gas and current were turned on, making a clear case of the flame being driven through the gauze and firing the gas and causing an explosion. The Clanny lamp without a cover over the gauze was then tried in the same current, and twice in succession when the gas fired in the lamp it went out; on the third trial before the lamp was placed in position a handful of fine coal dust was sprinkled over the gauze and with the turning on of the current about one half a peck of coal dust was liberated at the windward end of the box in a direct line with the lamp; where the result was a violent explosion of gas and dust on the outside of the lamp, the color of the flame was changed to a dark red, the chute was filled with sparks, and when the lamp was picked up the glass was found to be badly cracked. I had no means of ascertaining the percentage of gas present. The barometer was 28.86 inches 280 feet below the surface. Normal temperature of mine temperature was 57°, increased to 83°; average water gauge was 1.46, or about one-half inch.

It appears that the safer a lamp is the nearer it comes to being useless for light-giving purposes. The metallic cover around the short gauze interferes with the free burning of the lamp from the fact that it prevents the free supply of fresh air and the consequent free outflow of the burnt gases, and the result is the lamp becomes very easily choked and extinguished.

During the months of August and September I made over 100 tests with fire damp and coal dust combined under different conditions, and while I am not yet a believer in the "No firedamp present" theory in our mine explosions, I had proof enough to convince me that coal dust has been playing an important part in our past mine explosions, and that in our future mining operations coal dust should be regarded with almost as much dread as firedamp itself.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,

PROPRIETORS.

EDITOR—Jos. R. Thomas, C.E.
ASST. EDITOR—T. J. Cunningham.
MANAGER—C. E. Sanderson.

PUBLISHED ON EACH MONDAY OF THE YEAR AT

No. 32 Pine Street, New York.

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LIGHT, HEAT, STEAM, WATER SUPPLY,
VENTILATION, SANITARY IMPROVEMENT,
AND GENERAL SCIENCE

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AGENTS

NEW YORK.—AMERICAN NEWS Co., 39 and 41 Chambers Street.
Germany.—B. WESTERMANN & Co., of New York.

MONDAY, AUGUST 14, 1893.

The Market for Gas Securities.

Depression in values continues to be the rule, and the irregularity of the money market deters even the boldest of investors from making purchases the soundness of which could not for a moment be disputed. Consolidated gas sold as high during the week as 123, and as low as 118, and the number of shares traded in on the Exchange during that time was 690. To day (Friday) the opening was made at 118 bid, 122 asked. There is very little of this stock that is now in the hands of speculators, and this no doubt accounts for the comparative firmness of the shares, which have held up fairly well when the decline in other valuable dividend-paying properties is considered. The Company is in excellent shape, and is preparing for a tremendously heavy business this fall and winter. Other city gas shares are somewhat lower, but the quotations are merely nominal.

Nothing of moment is to be reported in connection with Brooklyn gas shares, which are all at prices that seem to be very low. Nothing positive has come out in respect of the progress that is making towards consolidation, the impression, however, being that the disturbed condition of the money market will prevent any agreement in the immediate future. Chicago gas was weak and irregular. The number of shares sold on the Exchange in the week was 191,700, and the maximum and minimum figures were 53⅜ and 45½ respectively. Bay State is weak and lower, and Consolidated, of Baltimore, holds its own at 51 to 51¼. Laclede common is reported at 11 to 12. A small block of stock in the Troy (N.Y.) Company was recently offered for sale at 120, which shows considerable of a decline.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 WALL ST., NEW YORK CITY.

AUGUST 14.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	118	122
Central	500,000	50	90	95
" Scrip	220,000	—	—	100
Equitable	4,000,000	100	145	155
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	130	138
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	35	40
Preferred	5,000,000	100	80	85
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	—	113
Citizens	1,200,000	20	99¾	100
" S. F. Bonds	320,000	1000	—	103
Equity Gas Light Co	2,000,000	100	—	—
Bonds	1,000,000	—	—	60
Fulton Municipal	3,000,000	100	125	—
" Bonds	300,000		102	—
Peoples	1,000,000	10	—	92
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	—	123
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	150	—
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	130	—
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Boston United Gas Co.—				
1s Series S.F. Trust	7,000,000	1000	65	—
2d " " "	3,000,000	1000	44	45
Bay State Gas Co.—				
Stock	5,000,000	50	10	—
Income Bonds	2,000,000	1000	40	—
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	51	51¼
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	85	90½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	101
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	108
2d "	2,500,000	1000	104	105
Consumers Gas Light Co., Jersey City	2,000,000	100	—	25
Bonds	600,000	1000	—	85
Cincinnati G. & C. Co.	7,000,000	100	192	—
Consumers Toronto	1,600,000	50	190	191
Central, S. F., Cal			—	100
Capital, Sacramento, Cal			—	55
Consolidated, Balt.	11,000,000	100	51	51¼
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	101
Bonds	250,000		—	—
Detroit Gas Co.—				
1st Mortgage			85	87
East River Gas Co., Long Island City	1,000,000	100	100	105
Bonds	500,000	100	100	102

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Sept. 5th, 1893, at 2 o'clock P.M.,

by the undersigned, at the said factory in Little Falls, Minn., to the highest bidder therefor for cash.

Each person or party desiring to bid shall, at or before the time of offering his said bid, deposit with the undersigned $500 in cash, or his bid cannot be considered; said $500 so deposited to constitute forfeit money for the faithful performance of the terms of the said bid. Any person desiring an inventory of the property constituting said gas factory and plant may secure the same by application to the undersigned.

Dated Aug. 7, 1893.

CHESTER W. BROWN,
Assg. of Peoples Gas and Electric Co.,

499-3 Little Falls, Minn.

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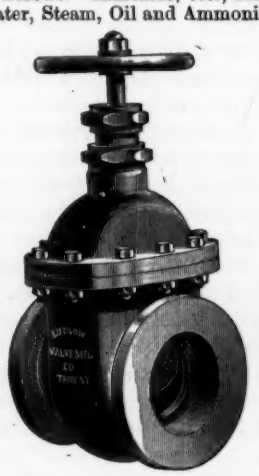

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[Sig.] E. A. BARNES.

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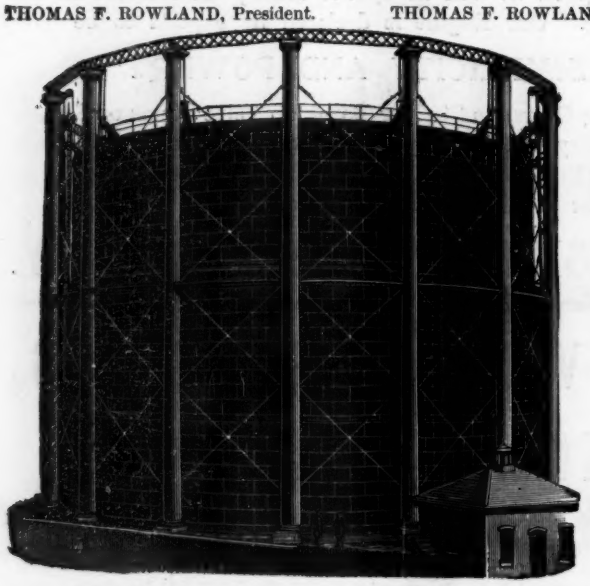

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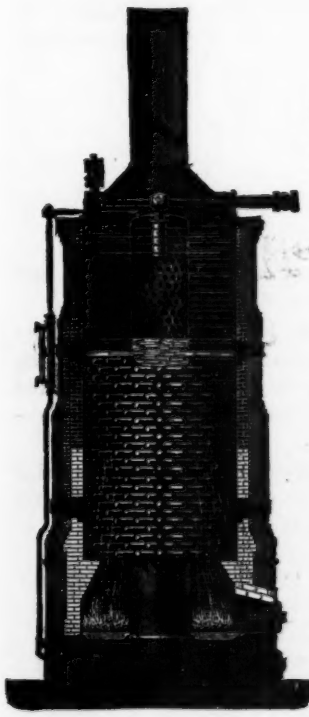

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An Unparalelled Record, of Over Twelve Years, for Economy, Durability, Safety, and Efficiency.
A Common-Sense High-Pressure Boiler made in a Superior Manner.
We Solicit for it the Critical Examination of the Mechanical Profession and the Steam-Using Public.

THE HIGHEST STANDARD OF EXCELLENCE.

Standard Sizes, 50 H.P. to 500 H.P.

THREE REGISTERED
THE HAZELTON BOILER.

THE PORCUPINE BOILER.
TRADE MARKS.

Special Sectional Boilers For Export.

The only Genuine Hazelton or Porcupine Boilers bear our Three Registered Trade Marks.

.·. BEWARE OF IMITATIONS. .·.

This Company is prepared to Manufacture and Furnish Plants of Boilers of any desired capacity, and will forward proposals and other information on application. All imitations of the substantial features of this Boiler are infringements, and will be prosecuted to the full extent of the law.

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Sole Proprietors and Manufacturers, NEW YORK, U. S. A.

Cable Address, "PAILA," NEW YORK.

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Correspondence Solicited.

Long Distance Telephone, 1229-18th St., New York.

This Boiler is producing unequaled results in the works of most of the principal Gas Co.'s of the U.S., and in similar plants in Foreign Countries.

NOT CONNECTED WITH ANY OTHER CONCERN IN THE UNITED STATES.

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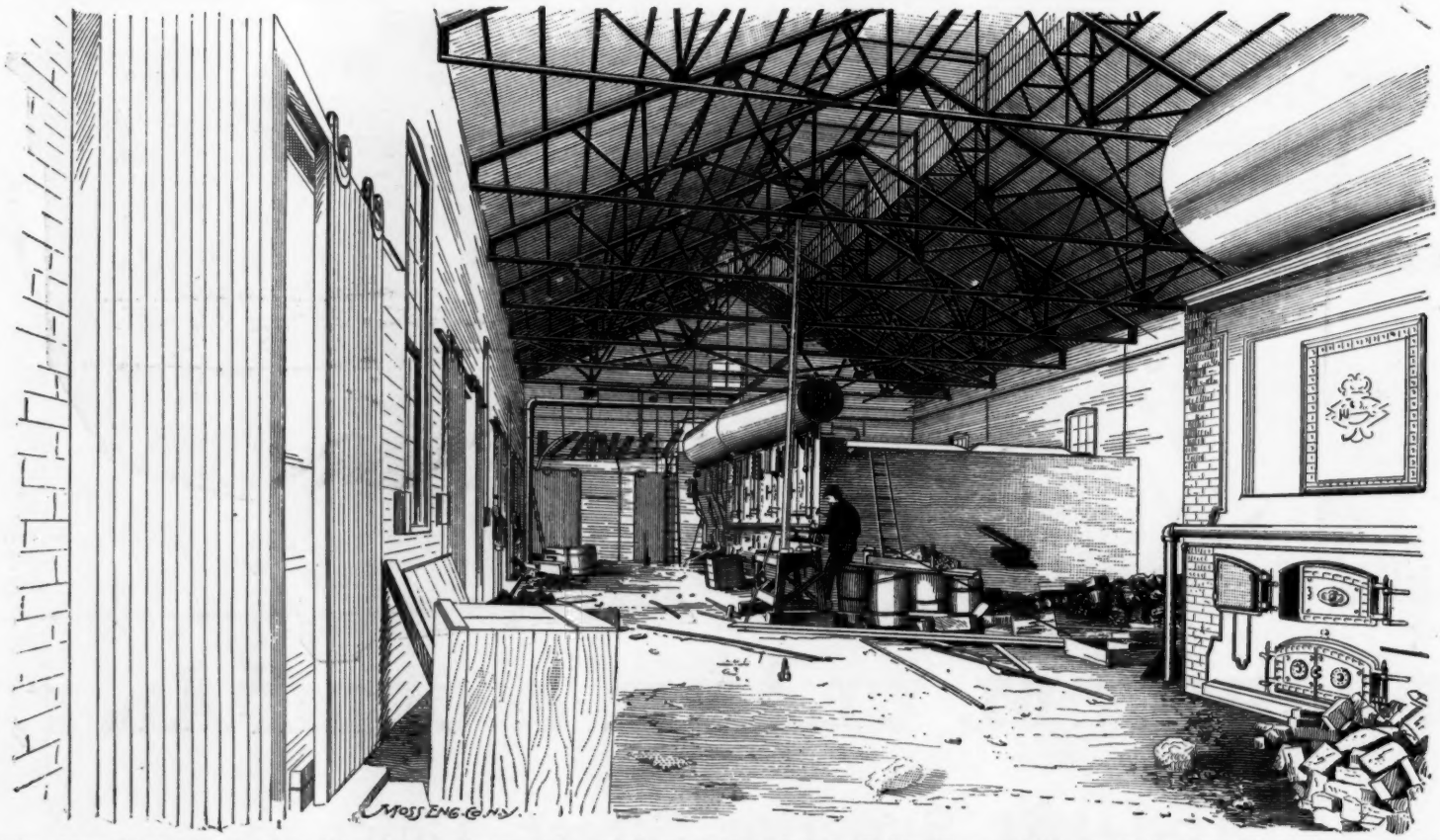
THE BERLIN IRON BRIDGE CO.



The above illustration is taken direct from a photograph, and shows the interior of a Boiler House which was designed and built by us for the Waterbury Brass Company, at Waterbury, Conn. The building is 50 feet in width by 105 feet in length, with brick side walls, the roof being of iron throughout, covered with our Patent Anti-Condensation Corrugated Iron Roofing, making a building fireproof in every way, and an iron roof which will not condense moisture and drip from the under side.

Write for Illustrated Catalogue.

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HIGH CANDLE POWER
FROM
GAS.

MR. WALTON CLARK, Assistant General Superintendent, United Gas Improvement Co.:

Dear Sir—In accordance with your request, I have made several ests of the new Welsbach mantel (called No. 169) for candle power and efficiency, and I herewith submit the following results:

	Candle Power.	Pressure.	Gas Consumed.	C.P. per Cu.Ft.
Average of Test No. 1,	67.05	.95 in.	2.6	25.70
" " No. 2,	63.86	1.00 in.	2.86	22.30
" " No. 3,	72.50	2.1 in.	2.87	25.26

The above averages are the results of trials on three different occasions, and in each case the mantles tested were made from a different lot of fluid.

The mantles used in the above tests were selected at random, and all had been dipped in kristaline and dried ready for shipment.

It is quite possible that better results could have been obtained by manipulating and readjusting the position of the mantles on the galleries, and also by waiting a longer period after burning off the kristaline; but I considered such fine adjustment undesirable in determining the commercial candle power.

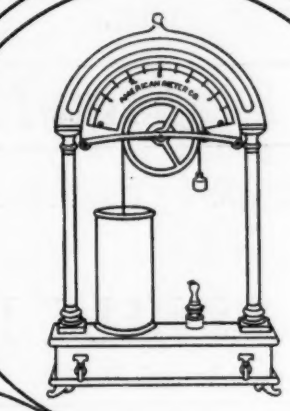
These tests were made on a bar photometer against a regular Edgerton standard slit. The candle power of the slit was 6.18, and the gas used was Gloucester City water gas, 26 candle power.

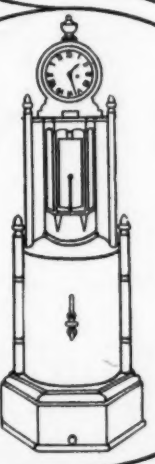
Very truly yours,
(Signed) C. H. PAGE, JR., M.E.

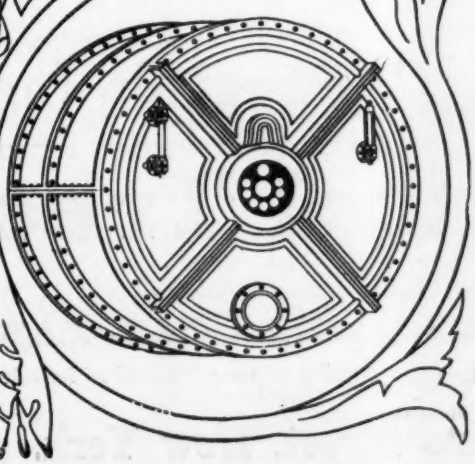
WE ARE NOW PREPARED TO FILL ALL ORDERS PROMPTLY FOR
HIGH CANDLE POWER WELSBACH LIGHTS.
Gloucester, N. J. WELSBACH LIGHT CO.

NEWBIGGING'S HANDBOOK FOR GAS ENGINEERS AND MANAGERS.

The present (the fifth) edition marks an important advance on those that have gone before. Considerable additions have been made to the text and much of it has been rewritten and otherwise improved. Price, cloth, $6. A. M. CALLENDER & CO., 32 Pine St. N. Y







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ESTABLISHED 1834. INCORPORATED 1863.

NEW YORK and PHILADELPHIA.

CHICAGO, CINCINNATI,

ST. LOUIS, SAN FRANCISCO.

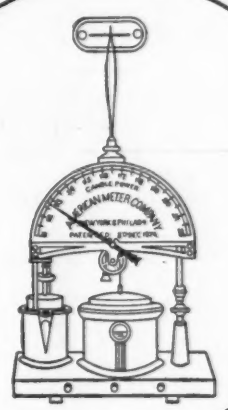
PUBLIC LIGHTING TABLE.

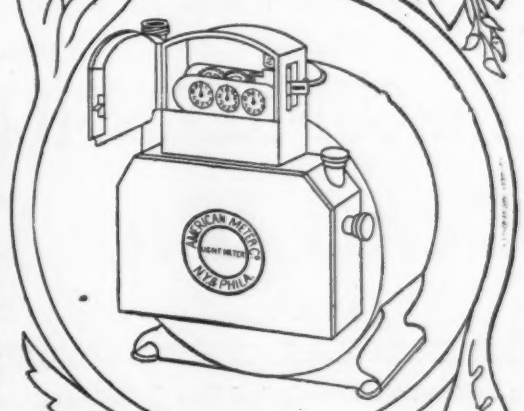
AUGUST, 1893.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Tue.	1	7.40 PM	10.30 PM	7.10	3.30
Wed.	2	7.40	10.50	7.10	3.30
Thu.	3	7.40	11.10	7.10	3.30
Fri.	4	7.40 LQ	11.40	7.10	3.30
Sat.	5	7.40	12.10 AM	7.10	3.30
Sun.	6	7.40	1.00	7.10	3.45
Mon.	7	7.40	1.50	7.10	3.45
Tue.	8	7.40	4.10	7.10	3.45
Wed.	9	7.40	4.10	7.10	3.45
Thu.	10	7.40	4.10	7.10	3.45
Fri.	11	7.30 NM	4.10	7.10	3.45
Sat.	12	7.30	4.10	7.10	3.45
Sun.	13	7.30	4.10	6.55	4.00
Mon.	14	7.30	4.10	6.55	4.00
Tue.	15	7.30	4.10	6.55	4.00
Wed.	16	8.30	4.10	6.55	4.00
Thu.	17	8.50	4.10	6.55	4.00
Fri.	18	9.20	4.10	6.55	4.00
Sat.	19	9.50 FQ	4.20	6.55	4.00
Sun.	20	10.30	4.20	6.45	4.10
Mon.	21	11.10	4.20	6.45	4.10
Tue.	22	12.10 AM	4.20	6.45	4.10
Wed.	23	1.10	4.20	6.45	4.10
Thu.	24	2.10	4.20	6.45	4.10
Fri.	25	No L.	No L.	6.45	4.10
Sat.	26	No L.	No L.	6.45	4.10
Sun.	27	No L. FM	No L.	6.30	4.20
Mon.	28	7.10 PM	8.30 PM	6.30	4.20
Tue.	29	7.10	8.50	6.30	4.20
Wed.	30	7.10	9.20	6.30	4.20
Thu.	31	7.10	9.40	6.30	4.20

TOTAL HOURS LIGHTING DURING 1893.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January...	217.30	January...	423.20
February..	200.30	February..	355.25
March	177.50	March	355.35
April.....	160.30	April.....	298.50
May.....	149.00	May.....	264.50
June.....	140.30	June.....	234.25
July.....	143.40	July.....	243.45
August....	154.50	August....	280.25
September.	171.50	September.	321.15
October....	202.20	October....	374.30
November.	221.30	November.	401.40
December.	248.50	December.	433.45
Total..	2188.50	Total..	3987.45





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Our Exhausters, sold from January 1st to August 1st, have

A Daily Capacity of 31,160,000 Cubic Feet.

Our Guarantee as to Durability, Efficiency, etc., is backed by our reputation and thirty years of experience.

We stand ready to prove that our machines are all we claim for them.

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If so, let us hear from you. Thousands now in use and giving perfect satisfaction.

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NOW ON THE MARKET.

The attention of Gas Engineers and Manufacturers is respectfully invited to our new

CYCLOIDAL EXHAUSTER,

the internal operating parts of which consist of two Revolvers, each p'aned accurately on cycloidal lines, the only Exhauster so constructed.

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In the form of a Genealogical Tree, including all the products discovered to date (the total number amounting to near 700), offers for sale a limited number of copies in Colors, mounted on Linen, with Rollers. Price, $3.50. Orders may be sent to

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ALTEN S. MILLER, Agent.

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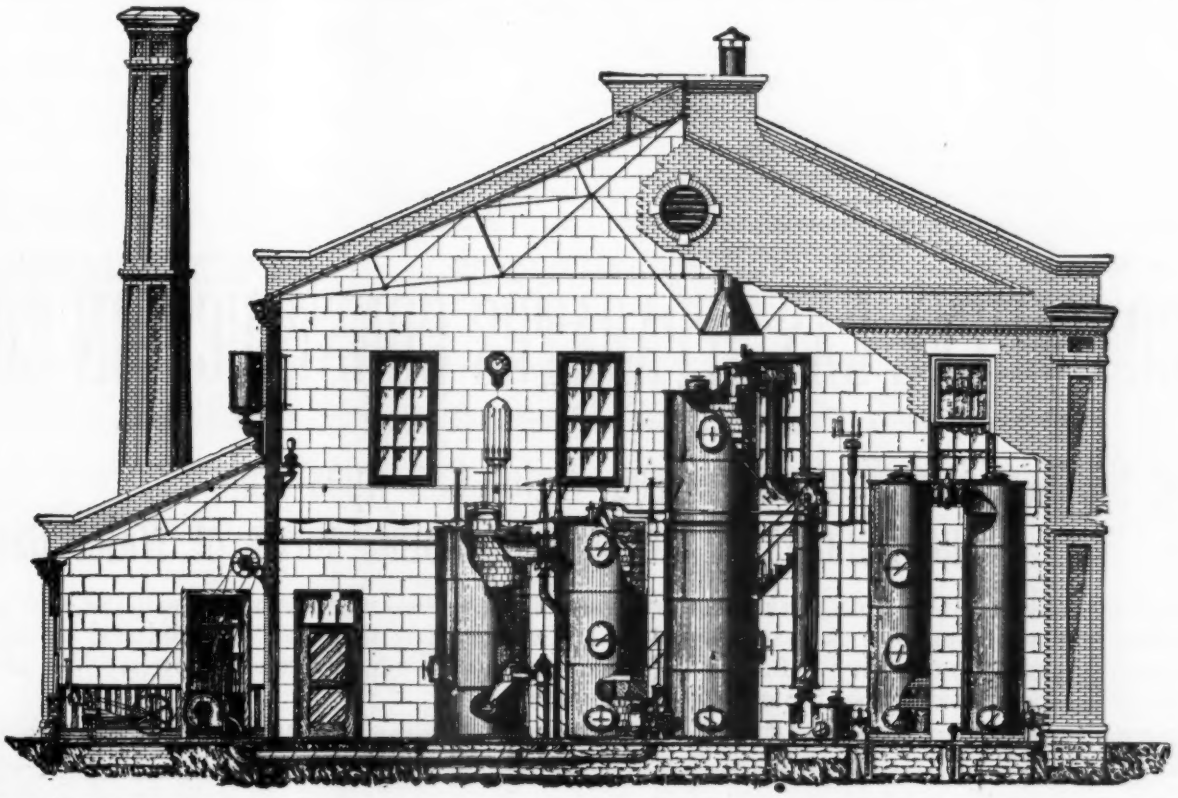
THE STANDARD LOWE WATER GAS APPARATUS.



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Water Gas Plants, either independent or auxiliary to Coal Gas Works, erected to meet any conditions. Apparatus designed to use any grade of Oil, and Anthracite Coal, or Gas House or Oven Coke.

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Gentlemen—We are in receipt of your favor of the 16th, advising us the National Gas Light and Fuel Company, of Chicago, will discontinue their advertisement from July 1st, and offering us the space occupied by them since 1885.

In thanking you for remembering us and for your kind expressions, it affords us great pleasure to advise you that we have decided to accept your proposition, as we fully realize the excellent advertising facilities afforded through the GAS LIGHT JOURNAL. In doing so we are also complying with repeated suggestions from the many friends we have gained in the fraternity, who have tried us with their orders. Our previous hesitancy in extending our advertising was due to the fact that, with our best efforts, we were unable to increase our facilities to meet the growing requirements; but with our new shop, to be completed this month, and which is being fitted up with special tools designed for the finishing of Gas Apparatus, we feel confident of being able to turn out all work intrusted to us promptly and in a first-class manner. We have taken the precaution to provide for any future extensions which may prove necessary. We now hope to extend our business relations with the fraternity, and will do our best to deserve it by prompt and first-class work and reasonable prices.

Yours very truly,
THE WESTERN GAS CONSTRUCTION CO.
By O. N. GULDLIN, Prest.

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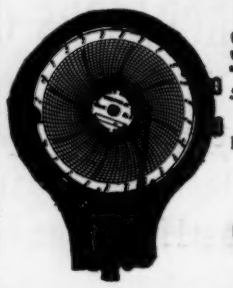

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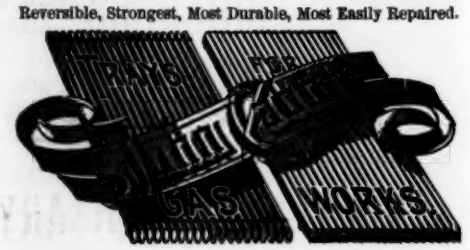

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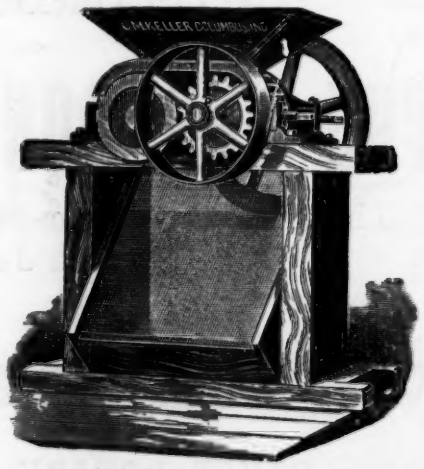

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SIMPLE, STRONG, AND DURABLE.

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Also, SPLINT AND STEAM COALS,
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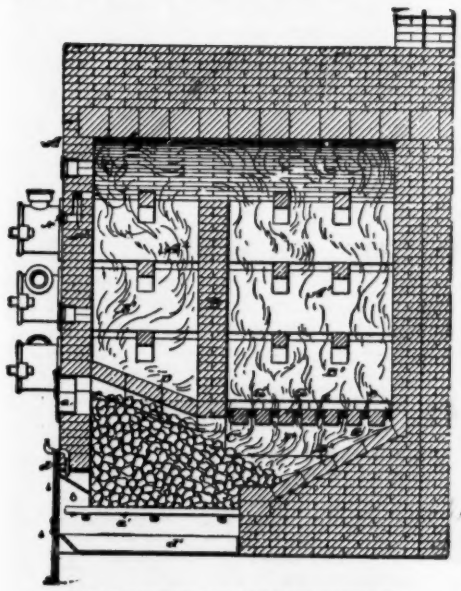

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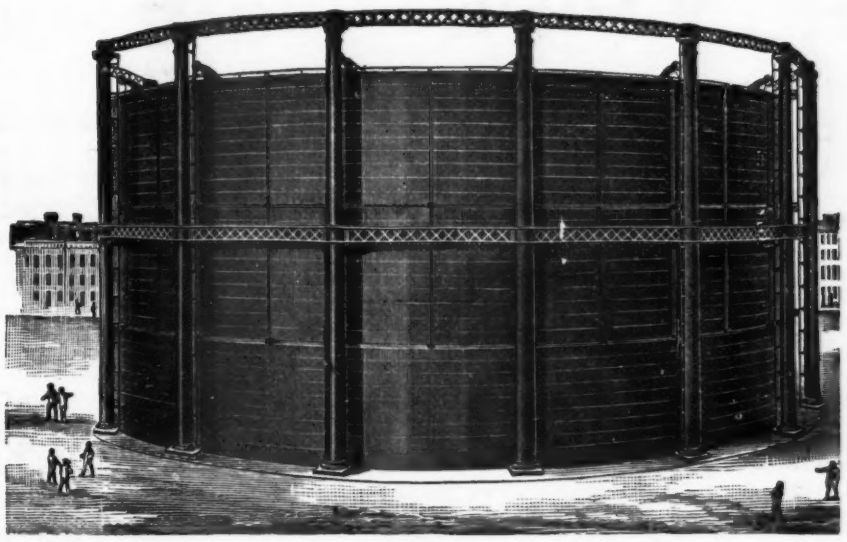

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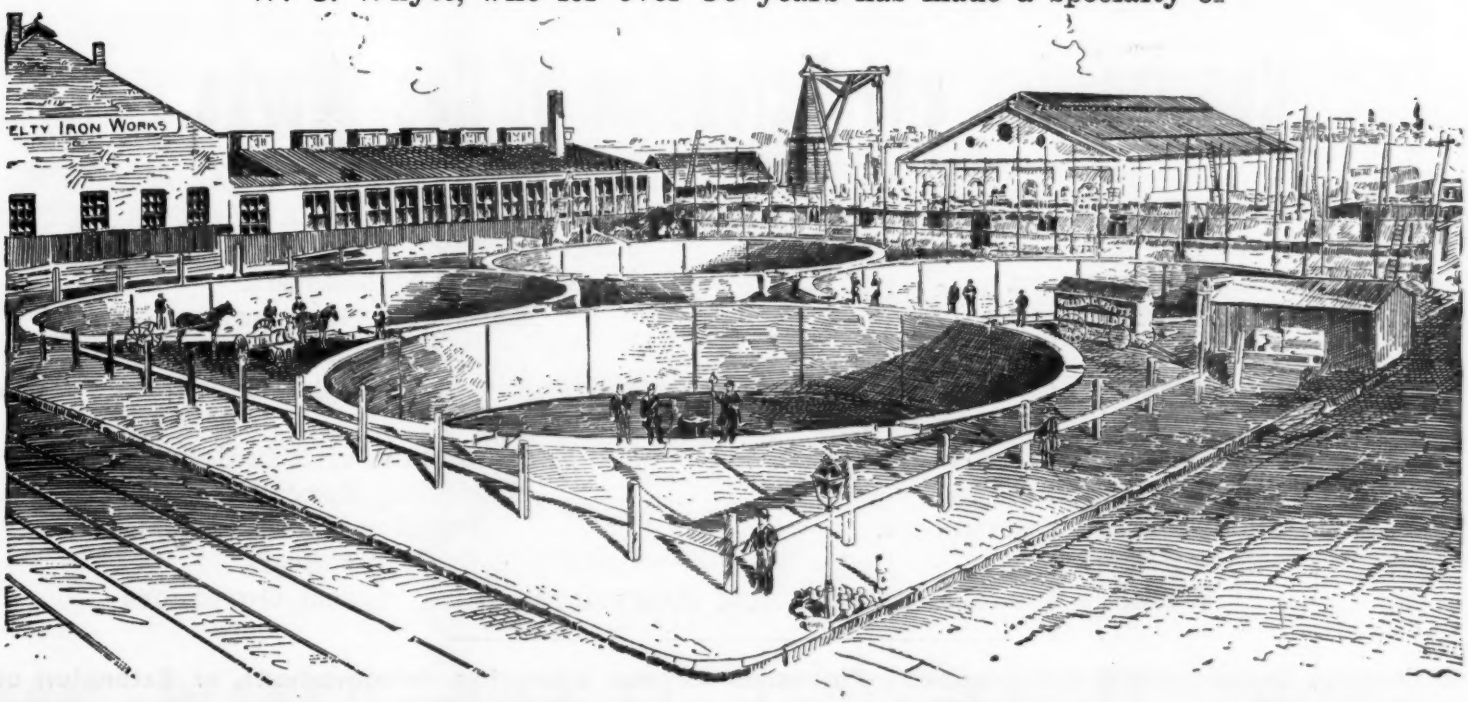

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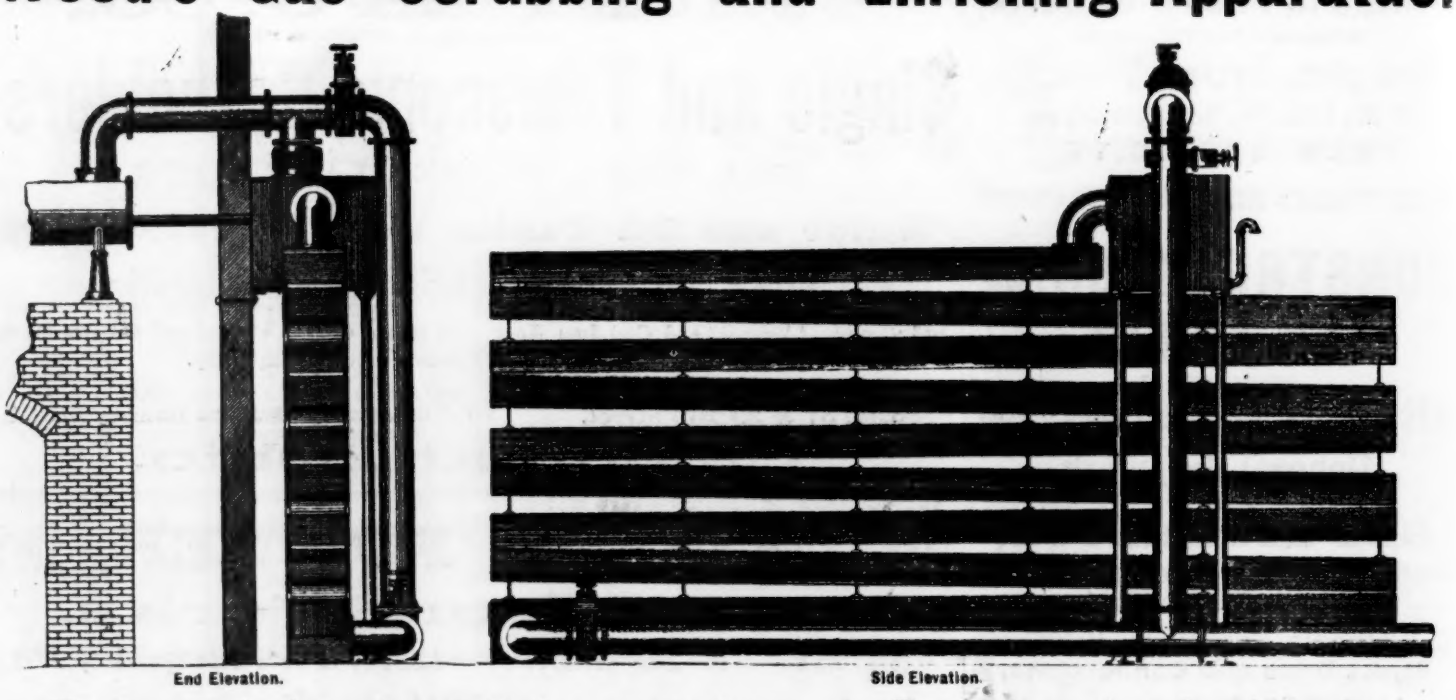

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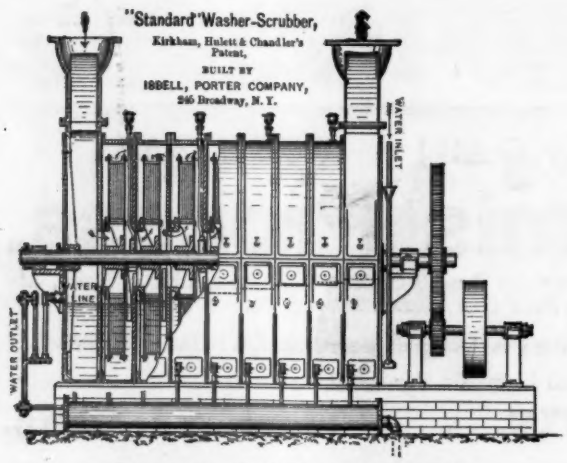

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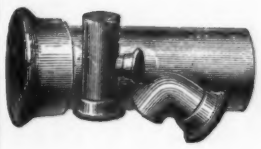

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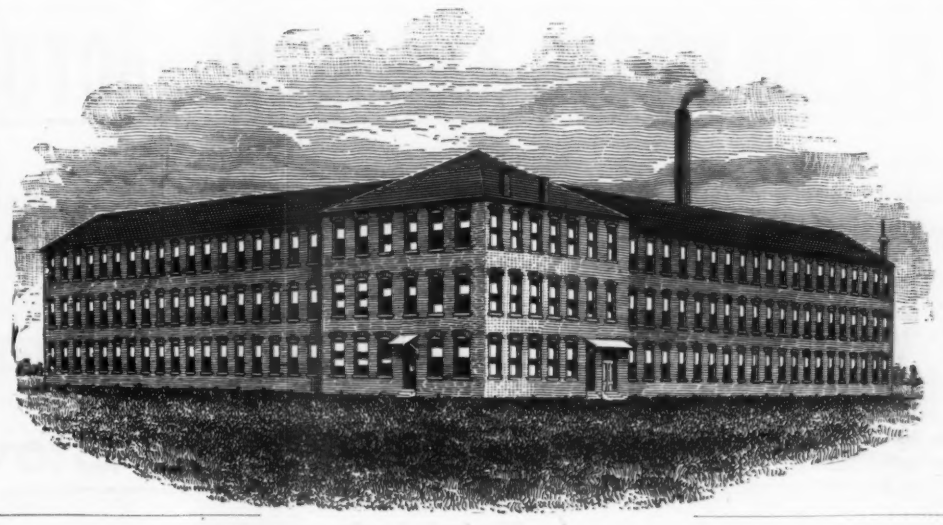

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The superior feature of this meter is that it avoids the danger of displacement of the valves, and consequent loss of gas, either in shipping, handling, or by dishonest consumers.

To designate from the regular Glover Meter, also made by us, we style the above the HEARNE-GLOVER Meter.

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IN A GREAT VARIETY OF STYLES AND SIZES.

Gas Cooking Stove No. 7 C.

The Most Economical, Efficient, and Durable Gas Stove Made.

SIZE.

Stove.	*Oven.*	*Broiler.*	*Top.*
31 inches high.	9¼ inches high.	10 inches high.	21 inches high.
17 inches wide.	15 inches wide.	15 inches wide.	16 inches wide.
	12½ inches deep.	12½ inches deep.	

Length over extension shelves, 32 inches.

This Stove has three Boiling Burners in the Top or Hot Plate, and single Oven Burner.

The consumption of this Stove is 35 cubic feet per hour, at 1½ inch pressure with all burners.

Three-eighth inch supply pipe should be used when the pressure is 1½ inches or over.

ALL FITTINGS ARE NICKEL PLATED.

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Station Meters (square, cylindrical, or in staves), Glazed Meters, King's and Sugg's Experimental Meters, Lamp Post Meters, etc., etc.

METER PROVERS (Sizes 2, 5 and 10 feet.)

Pressure Gauges of all kinds, Pressure Registers, Pressure and Vacuum Registers, Pressure Indicators (sizes 4, 6 and 9 in.), King's Pressure & Vacuum Gauges.

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